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Vacation Tour Through Lincoln Land

By Ralph Gray

"IT SEEMS the longer Abraham Lincoln is dead, the more he lives in people's hearts."

The storekeeper at Lincoln City, Indiana, had watched the people come and go for years. His village mart sold everything from fryers to film, much of the latter being bought by visitors to the Lincoln shrines near by.

"Every year there's more sight-seers; they come from farther away, and what they see they seem to appreciate more," he added.

This year I was part of the pilgrimage. With me were my wife and three children. Instead of spending our vacation at beach or mountain, we followed a trail of log cabins—the route of the great Rail Splitter in his youthful migration from Kentucky through Indiana to Illinois (map, page 146).

In our family, Abraham Lincoln long has been a hero and model. His patient face looks down from the walls of our children's rooms. Judith and Mary Ellen, 11 and 9 years old, always make up reports for their classes on Lincoln's birthday. Even 5-year-old William became familiar with the great man during the days we prepared for our trip.

We loaded our car with clothing, camp gear, camera supplies. The overflow went into "the attic," a box strapped to the top.

In the Tracks of Young Abe's Boots

At Hodgenville, Kentucky, west of the bluegrass, we crossed into "Lincoln Land," the three-State area enshrined in the hearts of Lincoln lovers as the scene of the 16th President's birth, growth to manhood, and first fame.*

Ahead of us lay the Lincoln National Memorial Highway, paved with history but a highway only in name. It is not to be confused with the transcontinental Lincoln Highway. For long stretches it is not marked at all, and at other places it is poorly signposted.

On its 425-mile length we bounced over rough trails that couldn't have been much improved since the Lincolns passed; we raised atomic-size dust clouds on gravel roads; we slashed through fords and along flooded lanes; we ferried the Ohio River; and at times we breezed over many, many miles of the Midwest's smooth concrete-slab roads.

Usually we were off today's beaten track in following the pioneer trail as closely as possible. Nearly every mile had the charm and simplicity of countryside far removed from busy highways. And every mile seemed to echo the tramp of Abe's boots, the bite of his ax in wood, the crack of his rawhide over oxen.

Lincoln Statue Near His Birthplace

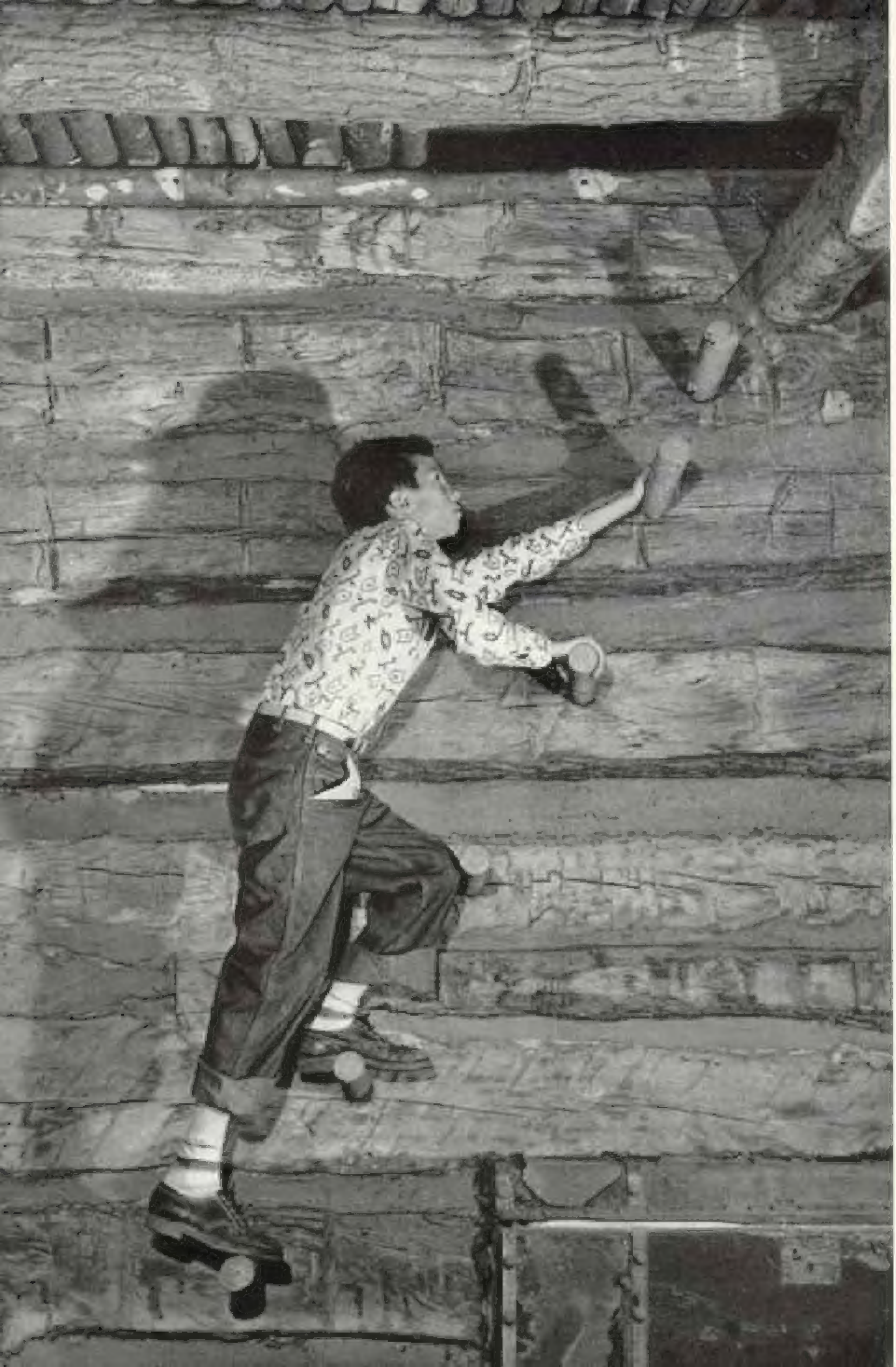
Two and a half miles south of Hodgenville, on February 12, 1809, Lincoln's travels began in a one-room log house. Before visiting the birthplace farm, now a national historical park, we gazed in admiration at Adolph A. Weinman's statue of Lincoln. It rises, majestic yet simple, in the town square of Hodgenville (page 149).

"I hope I can do justice to it," I said to Jean, my wife, as I prepared to photograph the statue. A townswoman overheard and said, "Don't worry. Our Lincoln is always perfect for picturetakers."

We walked up the main street to the Lincoln Memorial Library, a general library with a special case of Lincoln books. The Ladies Lincoln League of Hodgenville built the tidy stone structure with the proceeds of souvenirs sold at the birthplace park. The ladies also beautified the square around the statue.

"When did you organize the league?" I asked Mrs. Charles K. Sights, librarian.

* See, in the National Geographic Magazine: "Kentucky, Boone's Great Meadow," July, 1942, and "Patriotic Pilgrimage to Eastern National Parks," June, 1934, both by Leo A. Borah. Latter includes 15 illustrations of Lincoln country in color.



"Back in the days when the Government took over the birthplace farm," she said.

Mr. G. O. Kirkpatrick, Hodgenville's oldest native inhabitant, walked in.

"Those were the days!" he exclaimed. "I saw Teddy Roosevelt lay the cornerstone for the Memorial Building back in '09. I watched President Taft dedicate the building in 1911. Then I heard President Wilson's acceptance speech in '16."

My son seemed greatly impressed. "Did you ever see Lincoln?" he asked.

"I called on him once, but he wasn't home," Kirkpatrick said, not batting an eye.

Driving to the birthplace farm, I explained to the lad one of the facts of this life—its shortness.

Two months before *his* son, the future President, was born, Thomas Lincoln bought a 348-acre tract known as the Sinking Spring Farm, situated on the raw frontier at the edge of the Barrens. He paid $200 in cash and took over a small lien against the property.

We turned off the highway, parked, and walked through the handsome landscaped grounds of the Abraham Lincoln National Historical Park. The natural beauty of the setting struck Jean and me, as it had 12 years before on our honeymoon.

"Tom Lincoln knew how to pick a pretty location," my wife said, a remark verified over and over as we found several homesites of this man of many moves.

Birthplace Farm Spring Still Flows

Actually, beauty had little to do with a pioneer's selection of a home. What attracted the elder Lincoln to Sinking Spring Farm was the spring itself, a small stream flowing from a deep limestone recess and disappearing into an even lower stratum (page 155). Its cool waters were the first Abraham Lincoln tasted.

"Why, it's still flowing!" a graying lady said as she descended to the cool, cavelike confines of the spring. "It makes you feel closer to the Lincolns than anything else."

The surface heat hit us like a wall when we left the spring and climbed the stairway to the Lincoln Memorial Building in which the National Park Service houses what is said to be the traditional birthplace cabin. Connecticut pink granite and Tennessee marble impressively protect humble Kentucky logs and clay (pages 150 and 151).

A dirt floor, a leather-hinged door, one small window, a bed of bearskins in the corner, the winter wind whistling through log walls—such was the scene of Abraham Lincoln's birth (page 152). But Nancy Hanks Lincoln regarded her babe with motherhood's eternal hopefulness. She handed him proudly to 9-year-old Dennis Hanks, a cousin. When the baby cried without stopping, Dennis said, "He'll never come to much," according to one biographer.

Visitors in a constant stream poured through the building as I talked with Benjamin H. Davis, then park historian. Car license plates showed they came from Indiana, Kentucky, Ohio, Pennsylvania, Wisconsin, Massachusetts, Georgia, Colorado. Attendance has tripled since 1946.

Reverent Mood Grips Visitors

Children had raced up and down the long inviting slope of steps outside the memorial, but, once inside, their shenanigans ceased without a word from their parents. A reverent mood gripped each visitor.

Volumes of Lincolniana line a wall. One mother held her three preschool children enthralled for more than an hour as she read to them of spring water, corn-shuck mattresses, coonskin hats, and loft bunks under log eaves where frontier youngsters fell asleep above flickering fireplaces.

Near the spring a large white oak rises. It was a prominent landmark even before the Lincolns came; it marked the boundary of their farm. Behind the huge tree we picnicked in a grove alive with blue jays. Their feathers glinting in the shafted sunlight, the saucy birds jumped and flounced about us. Days later, Will, seeing a cardinal, said, "Look, Daddy, see the red jay."

Thomas Lincoln lost Sinking Spring Farm through failure to pay off the small lien against it, and the family moved 10 miles northeast to a farm on Knob Creek.

This was the first home young Abe remembered and a place of close association with his mother, Nancy Hanks Lincoln. Biographers picture him at his mother's side before the cabin log fire, her fingers patting his hair. As she told the stories of the Bible, the boy drank in the woman's quiet nobility and her vague yearning for a better life. He sensed her disappointments. A baby brother had come, to die in infancy.

Nancy's Bible enjoined her to lift up her eyes "unto the hills." At the Knob Creek place she could do this every time she stepped outside. The ridges and folds of Muldraugh's Hill surrounded her cabin home.

Wooded knoblike protuberances over the landscape give the area its name—the Knobs (page 166). This region is the dividing line

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National Geographic Photographer William E. Fabor

← Up the Peg Ladder to Bed in the Loft: A Hoosier Boy Acts Out Lincoln's Routine

Many pioneer children slept in dark attics, away from the fireplace's warmth. This Rockport, Indiana, cabin copies one in which Abe lived as a boy. Page 168 shows the exterior; page 163, the hearth.

Horses Still Race in Charleston Fairgrounds, Where Lincoln Debated Douglas in 1858

A stone (upper right) marks the site of the fourth debate of the famous Illinois series (opposite page). Here Stephen A. Douglas, running for re-election to the Senate, charged that Lincoln as a U. S. Representative had voted against supplying the Army in the Mexican War. Abe, in dramatic refutation, introduced a pro-Douglas ex-Congressman to the crowd, asserting, "He personally knows it to be a lie!"

between the plateau on which the birthplace farm is situated and the bluegrass region. We drove northeast from Hodgenville, and the road soon dropped over the escarpment in a series of curves and one hairpin turn. This was the "Bigg Hill" that Tom Lincoln, as road supervisor for the section, was directed to repair in 1816.

On a side road that used to be the main pike from Louisville to Nashville, we jounced over what was left of "pavement" laid long ago. Rock slabs were placed on edge, like slices in a loaf of bread, the upper edge forming the road surface (page 154). What labor such a road must have entailed! What a godsend it must have been in muddy weather, but how bumpy in a springless, iron-tired wagon!

Boyhood Cabin Used for Firewood

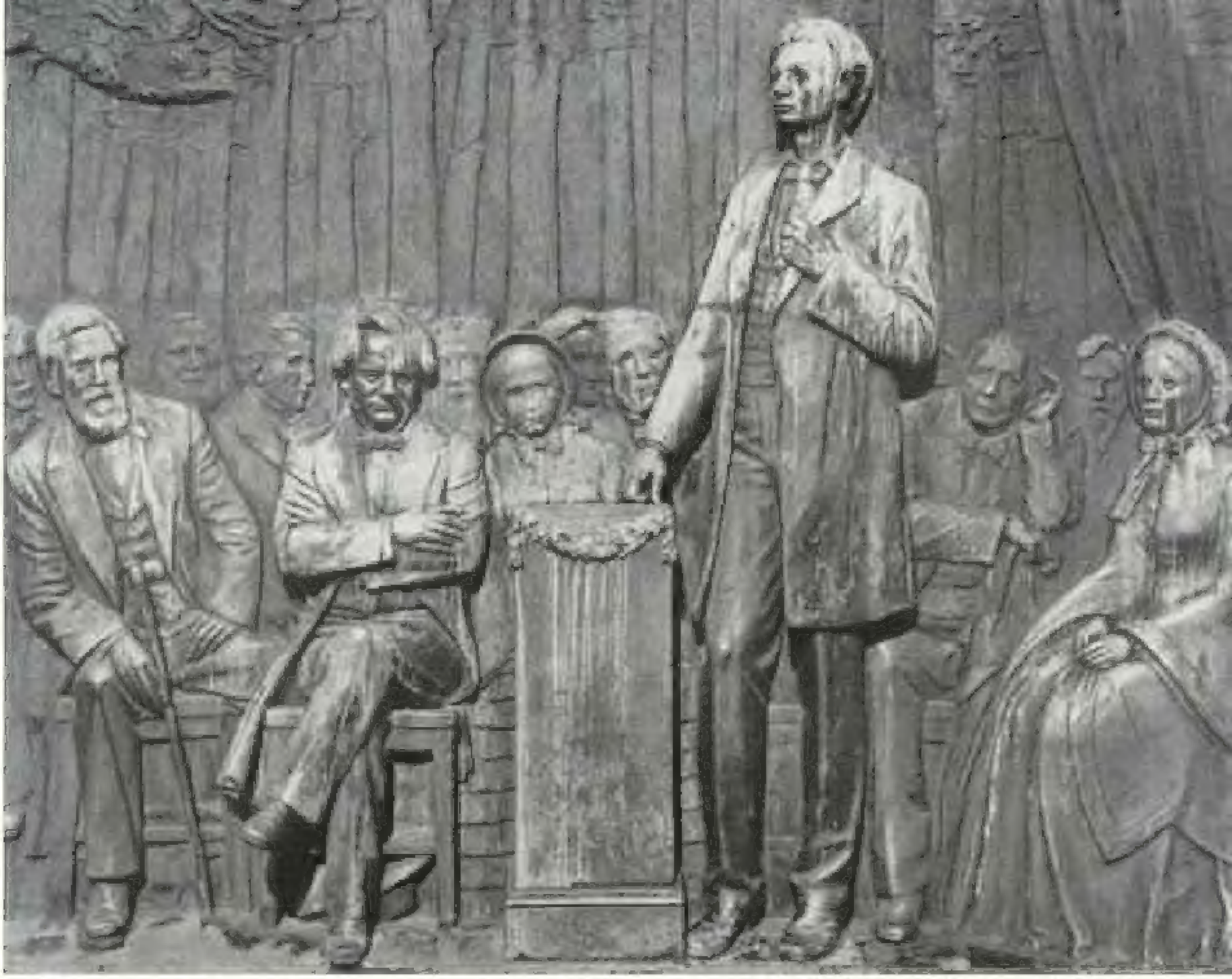
Down the Bigg Hill we came to the Knob Creek place. Beside the highway stands a privately owned replica of the Lincoln cabin. Mr. Fred Howard, custodian, told me its story: "The late Uncle Bob Thompson, who used to live across the road there, remembered the original Lincoln cabin. He said it was used as a corncrib, then later moved to a neighbor's place and chopped up for firewood. When we decided to build a replica, he knew where to put it and what it should look like. We used the logs from the Gollaher cabin, which stood on top of that knob there at the head of the hollow."

"Was that where Austin Gollaher lived, the boy who saved Abe from drowning?" I asked.

"Yes. Gollaher repeated the story to Uncle Bob Thompson, and Uncle Bob passed it on to us. Want to see where it happened?"

We walked across a recently cut red clover field to a branch of Knob Creek. It was bone-dry. But a bare shale bank on the other side showed where the creek had cut into the foot of a knob during high water.

"In those days a log lay across the creek here. Abe slipped off into the rain-swollen waters, which carried him swiftly downstream. The Gollaher boy ran alongside and held out



 National Geographic Photographer B. Anthony Stewart

Lincoln, at Quincy, Propounded the Basic Issue: Is Slavery Right, or Is It Wrong?

Lincoln lost the Senate race, but two years later won the Presidency, largely on the national reputation gained in these debates. He defeated the man who had beaten him. When the South seceded, Senator Douglas remained loyal to the Union; he died in 1861. Here, seated beside the lectern, he ponders Lincoln's words, spoken in Quincy, Illinois, "not merely in the face of audiences . . . but in the face of the Nation."

a pole for his playmate to clamber ashore on."

As we strolled up the hollow behind the cabin at dusk, the sun sent the long shadows of the westerly knob tops marching through the clover (page 155). The hush of evening helped us peer into the past. We imagined the boy Lincoln dropping pumpkin seeds at every other hill of corn. For this was the seven-acre field where Abe learned that labor is not always rewarded. The next morning a drenching rain washed out all his pumpkin seeds as well as the seed corn.

Abe and his older sister, Sarah, walked two miles down the valley to school. Lincoln later said that his entire schooling amounted to less than a year. At Knob Creek he learned his ABC's in a "blab school," so called because the pupils repeated their lessons aloud until called forward to recite.

As we were leaving Knob Creek late in the evening, a group of Boy Scouts trudged into the park beside the cabin and flopped down at a picnic table. They opened cans of beans and crushed pineapple and ate from both indiscriminately. One pulled off dusty sneakers and probed tender blisters. They had completed 20 miles of the 34-mile Kentucky Lincoln Trail hike from Elizabethtown to the birthplace farm.

"Where are you boys from?" I asked, expecting them to give a local name.

"Explorer Posts 303 and 10, Belleville, Illinois," was the surprising answer.

Scouts from all over the United States earn badges by walking marked Lincoln trails in Kentucky, southern Indiana, or central Illinois (page 156). To the ribbons of their badges they add bronze, gold, and silver footprints when they repeat the hikes.

The Kentucky Lincoln Trail follows highways and back roads, mostly the latter. I pumped the hikers for information, for I planned to drive over the route the next day. They doubted that I could make it.

"The ruts are awful deep," said one. "West of Roanoke is the worst place. I don't think it's been improved there since Lincoln went over it!"

The Tramp of Abe's Boots Echoes Down the 425-mile Pioneer Trail

Thomas Lincoln moved from Kentucky to Indiana when his son was 7 years old; he trekked to Illinois 14 years later. From Hodgenville to New Salem the author traced the Lincoln family's migration route.

I resolved to try it. At Athertonville we left the paved highway and climbed Muldraugh's Hill on a narrow, winding, natural-earth road. On top the road straightened and followed a broad ridge. No streams crossed the well-drained right of way. But the ruts were deep. Many a time the oil pan and frame of the car scraped bottom.

Back Road Has "Lincoln Feeling"

"You get a real 'Lincoln feeling' on this road," said Judith. "Look, there's a log cabin with someone living in it."

From the rank woods on one side of the road emerged a brown-spotted hound with a limp in the right front paw. He trotted amiably behind us on three cylinders.

Near the deserted crossroads of Roanoke a family bent to the task of setting young tobacco plants in the black earth. Day lilies and Queen Anne's lace lined the road.

We came back to the present in Elizabethtown, a bustling hub of half a dozen busy highways. Army men on passes from near-by Fort Knox sprinkled the sidewalk throngs with khaki. "E-town" swarms with life today, as it did in comparative degree in the fall of 1816 when the Lincolns went through on the way to Indiana. Six years before, it had reached 180 inhabitants. It was the biggest town for miles around, by far the largest 7-year-old Abraham had ever seen.

To the elder Lincolns, Elizabethtown was homecoming. Ten years before, just married, they had settled there. Sarah, the first child, was born there.

Thomas Lincoln was well known in the courthouse for his land suits. Some were pending at the time. But, having lost or been dispossessed of three farms in Kentucky, the self-reliant Tom had decided to leave the State entirely and take up accurately surveyed "Congress lands" in Indiana, where clear titles could be obtained. The Lincolns, along with nine neighboring families, were dispossessed of their Knob Creek lands by other claimants to the property.

Years later, the Great Emancipator wrote that his father moved from Knob Creek to Indiana "partly on account of slavery, but chiefly on account of the difficulty in land titles in Kentucky."

147 Royal Photo Co.

Theodore Roosevelt (Hat Lifted, Left) Visited Lincoln's Kentucky Birth Site in 1909

A century after Abe entered the world, President Roosevelt laid the cornerstone of the Lincoln Memorial Building, which now shelters the cabin (pages 150, 151, 152). His wife and daughter Ethel accompanied him.

The type of conveyance used, the kind and number of livestock herded along by the pioneer family, and the route taken by the party are subjects of dispute among historians.

However, the Lincoln Memorial Highway Commission of Kentucky, reporting to the Governor of Kentucky in 1935 after an exhaustive study of documentary and other evidence, officially designated the route of the proposed memorial highway through Kentucky. Though this recommended route never has been marked with roadside signs, I was able to follow it by using the commission's report as a guidebook.

North we went out of Elizabethtown, leaving a comet's tail of white dust as our tires churned the gravel surface of Kentucky route 251. Soon the gravel changed to earth. Farms stopped and scrub woods began. The road took on a deserted air.

Suddenly we passed a couple of armed sentries in full battle dress. To our left in a clearing we saw a large group of tanks. A sign nailed to a tree proclaimed "Bivouac Area 14." We had entered the huge Fort Knox Military Reservation.

Nobody stopped us, so we kept going, looking for Mill Creek Cemetery where Abe's grandmother lies buried. We pulled aside and ate dust as a truck convoy roared by. The terrain on all sides was chewed by tanks, and now we saw the metal monsters everywhere.

Ahead, an unmanned half-track was stopped on the road.

"Its driver is probably in the ditch, pinned down by 'enemy' fire," said Jean, looking around apprehensively. "I don't like this. Let's get out of here."

"Tank Trap" Forces Detour

A deep ford finally turned us back. For all I knew, it could have been a tank trap. Later, from near Radcliff on U. S. 31 W, we entered the reservation again and found Mill Creek Cemetery, an island of sleep in the midst of modern war games.

East of here was the farm of William Brumfield, who married Nancy, Tom Lincoln's sister. With them in her final years dwelt Bathsheba Lincoln, mother of Tom and Nancy, widow of Capt. Abraham Lincoln, and grandmother of young Abraham.

While visiting here en route to Indiana, Abe no doubt heard the old stories retold by his elders: How his namesake grandfather, while living in Virginia's Shenandoah Valley, had been stirred by stories of Daniel Boone and moved to Kentucky in the early 1780's. How, a few years later, he was killed in an Indian ambush while working in a field with his three sons. How the young lad, Tom, leaning over his father's body and, about to be snatched up by a savage, was saved by a timely bullet from the rifle of Mordecai, his oldest brother. How the widow Bathsheba held the fatherless family of three sons and two daughters together amid the trials and hardships of pioneer Kentucky.

When Thomas Lincoln and his family left the Mill Creek community, they said goodbye to the last of their relatives and friends in Kentucky and set their faces toward Indiana and a new life. We followed them west—through Vine Grove, Flaherty, Big Spring, Custer, and Hardinsburg, Kentucky.

At Big Spring we bought groceries in the general store and picnicked beside the cool spring. A half-dozen townsmen came by to dip water while we were there, still using the free-flowing waters which attracted westward-moving pioneers, including the Lincolns. The spring is really a subterranean stream which surfaces for 100 feet, goes under a natural bridge (a "self-made bridge," as one native described it), and soon disappears again.

"Lots of underground water in this limestone country," said an overalled villager on the store's porch. "I recollect one time the old woman was carrying on. Said she broke the string holding a bucket of butter deep in our spring well. I said, 'I reckon we'll have butter for supper.' I went across the fields to where the water hits the surface and just waited until the butter came through."

From Hardinsburg to Hawesville, Kentucky, we made no attempt to follow the inland ridge-trail route of the Lincolns, because much of the 30-mile stretch is roadless today. We paralleled the Lincoln track by traveling U. S. 60 through Cloverport to Hawesville.

"At Sea" on the Ohio River

Mrs. A. H. Rees welcomed us to Hawesville, an Ohio River town stretched mostly along one lengthy street parallel to the levee. Her husband was "at sea," working at his calling as an engineer in one of the many powerful towboats which push strings of barges up and down the Ohio and Mississippi. The parlor walls were covered, like those of a New England sea captain's home, with pictures of ships and other nautical subjects.

A busy ferry plies the broad river, connecting Hawesville with Cannelton, Indiana (page 156). The Lincoln Memorial Highway Commission of Kentucky resolved 20 years ago that this site seemed to be "the most practical point . . . for a crossing nearest to the actual location of the ferry" which carried the Lincolns over the Ohio.

Before boarding the open craft, we drove down the river road toward Lewisport to try to locate the site of Thompson's Ferry, the "actual" crossing of the Lincolns. On the farm of Russell Lawson (page 167) we found all the earmarks: an earth road coming from the direction of the inland hills and dead-ending at the river shore opposite and slightly upstream from Troy, Indiana, and the mouth of Anderson River.

Refinery at Lincoln Ferry Site

Back at Hawesville, we crossed to Indiana and quickly reached Troy (page 183).* Just beyond the old river town the highway bridges Anderson River a hundred yards from its junction with the Ohio. Two oil barges clogged its mouth. Pipes ran from the barges to a near-by refinery.

One of Indiana's well-tended roadside parks invited us to stop. We learned that 16-year-old Lincoln, returning here from his Indiana home 16 miles northwest, operated a ferry across Anderson River for about nine months. Since his wages of 25 cents a day were paid to his father, he sometimes picked up a bit more for himself by doing extra work.

Once two travelers asked if he would scull them out to a steamer in mid-Ohio. They paid him half a dollar apiece. Years later he told Secretary of State William H. Seward:

"I could scarcely believe my eyes as I picked up the money. You may think it was a very little thing . . . but it was a most important incident in my life. I could scarcely credit that I, a poor boy, had earned a dollar in less than a day. . . . The world seemed wider and fairer to me."

This money-making venture brought Lincoln before the law. A licensed ferry operator charged him with operating without a license. Haled before Justice of the Peace Samuel Pate, Lincoln successfully defended himself by saying that he did not "set (his passengers) over the river" but only halfway, an act requiring no license.

Lincoln National Memorial Highway signs mark the remaining miles to Lincoln City. Where Abe's father literally hacked a road out of the wilderness, we breezed past modern Santa Claus, Indiana, with its famous post-office cancellation mark, beloved of stamp collectors, and hurried on to set up camp in Lincoln State Park, 5 miles west.

* See "Indiana Journey," by Frederick Simpich, National Geographic Magazine, September, 1936.

Kodachrome by Ralph Gray

An American Family Launches a Pilgrimage Through Lincoln Land

Author Ralph Gray, wife, and children here begin retracing the Rail Splitter's youthful travels through Kentucky, Indiana, and Illinois. The statue stands in Hodgenville, Kentucky, close to Lincoln's birthplace.

Lincoln Memorial Building, a National Shrine, Marks the President's Birth Site

[illegible]

Lincoln Was Born Behind Humble Door February 12, 1809

[illegible]

Sinking Spring Slaked Young Mex's Thirst

[illegible]

Yesterday's Highways Are Today's Byways in Lincoln Land

[illegible]

"The Place on Knob Creek . . . I Remember Very Well. . . ."—A. Lincoln

▲ Uncle John Doyle Tells of Lincoln's Ohio River Crossing

[illegible]

▼ Boy Scouts Watch Their Master Thoroughly Tilt a Canteen

[illegible]

Our tent was headquarters for four days while we visited the sanctuaries in the hills of southern Indiana (page 158). By camping, we felt we were re-creating in small degree the rugged conditions the Lincolns lived under during their first winter in Indiana. Winter had already set in when they arrived at their quarter-section claim. At once they threw up a "half-faced camp"—a three-sided cabin of poles and brush. At the open southern side a fire burned day and night.

A few yards away the father built a snug, roomy log cabin. On this farm on a bird knoll at the headwaters of Little Pigeon Creek he and his son lived 14 years. Abe grew from a child of 7 to a strapping 6-foot 4-inch giant of 21.

After a camp breakfast we drove the short distance to Lincoln City, which grew up on the historic land long after the family had moved on to Illinois. The storekeeper told me he recently bought two acres just north of the village.

"The abstract was six inches thick and went back to the original paper of Thomas Lincoln," he said. "Across the road there is where his cabin stood."

We entered the quiet, wooded area of Nancy Hanks Lincoln State Memorial. At the cabin site we were interested to see that, instead of a complete restoration, only the sill logs and fireplace were reconstructed (page 169). The Indiana Lincoln Union, which deserves much of the credit for the impressive memorial layout, explains:

"For countless generations mankind has held the hearthstone as the altar of his home, a place of joy in times of prosperity, as a refuge in adversity; a spot made sacred by the lives of those spent around it. This is the hearth set here to mark the place where Lincoln at his mother's knee learned . . . integrity and strength . . . kindliness and love."

"Milk Sick" a Dreaded Scourge

The close companionship between mother and son was soon to end. A scourge called the "milk sick" swept the Little Pigeon community. Cattle and people died after a violent and mysterious sickness. Nancy Hanks Lincoln, a weary and worn old woman in her middle thirties, was one of the victims.

Her husband and Dennis Hanks whipsawed planks from a log. Abe, 9 years old, whittled [illegible] pegs. On a wooded knoll they buried Nancy Hanks among the "friendly trees" (page 170).

As we walked from the cabin site along the Trail of Historic Trees to the grave, the friendly trees were still there, mostly second-growth timber and plantings allowed to flourish after the Indiana Lincoln Union and the State of Indiana initiated their memorial plans in the late twenties.

It heightened our sense of history at this hallowed spot when Judith looked down at the rocky path and by good fortune picked up a perfectly shaped Indian arrowhead.

Beyond the burial knoll the land slopes to the south. Here lies the front approach to the grave and cabin site. The great flag at the top of a massive shaft rippled and [illegible] the Alley, a grassed swath connecting grave and Memorial Plaza (page 171). Two Indiana limestone structures front the plaza—the Nancy Hanks Lincoln Memorial Hall and the Abraham Lincoln Memorial Hall. They are connected by bas-relief scenes from the Emancipator's life (page 169).

Where the memorial grounds end, the State park begins. Little Pigeon Creek is dammed, forming a lake in which hundreds of visitors swim every summer week end. We took dips at every opportunity, walking to the lake from our tent.

A Stray Dog Shares the Pillow

One night I awakened to hear rain drumming on the canvas above us. Lightning ripped the sky. During flashes my wife and I glimpsed the untroubled faces of our sleeping children. We dropped back to sleep.

In the morning Jean said, "It must have rained cats and dogs last night. Look!"

Sharing Mary Ellen's pillow was a stray mongrel (page 158). Dog and girl were sound asleep. I attempted one flash-camera shot, whereupon the stranger bolted.

That day we drove to Dale, Indiana, largest town in the vicinity of "Nancy Hanks," as we began calling the memorial area. Here S. Grant Johnson, O. V. Brown, and others keep alive Lincoln traditions of the area.

Both the Johnsons are descended from neighbors of the Lincolns. Their home is filled with books, implements, and other Lincolniana. A froe, an almost forgotten wood-working tool, interested me. Mr. Johnson, 83 years old, took me outside and showed me how Abe and other pioneers used the maul and froe to slash thick shingle-like clapboards for roofing log cabins.

I wanted to find out more about the milk sickness that took Nancy Hanks away. One of my forebears had died of the same cause in southern Illinois while migrating from Virginia to Missouri, and I had read how the scourge obliterated whole communities.

"What made milk sickness die out?" I asked Mr. Johnson.

"It hasn't," he said. "Every year you hear of two or three cows dying from it. They eat snakeroot blossom and get the trembles."

Breakfast Summons Young Apprentice

[illegible]

"But what about people? What saves them? Pasteurization?"

He scoffed at this.

Later, in the library of J. T. Dudley of Terre Haute, Indiana, I learned that white [illegible] contains a deadly poison. When eaten by cattle, the poison is transmitted to the milk and its products. If people continue to consume the poisoned foods, they die. Early settlers did not realize this, in fact, not until the present century did science pin down the cause.

Little snakeroot grows in today's better-tended pastures. Farmers throw away milk of affected cattle, hence very seldom, if ever, does poisoned milk reach human lips.

The morning after our talk with Mr. Johnson, my daughters emerged from the tent with bloated faces and eyes swollen shut. "Dad's mother and I were shocked! Could this be [illegible] sickness? We remembered an out-of-the-way eating place a few days back where milk had been served in glasses instead of from sealed bottles.

It turned out that our wild guess was not too far wrong. The children were poisoned and they got it from a plant—poison oak!

But swollen faces, itchy fingers, and all, we continued our pursuit of Lincoln. We drove to Gentryville, two miles west of Lincoln City, over the Lincoln Boyhood Trail, a scenic archway.

First Flatboat Trip to New Orleans

Abe walked this trail countless times to the Gentryville stores, where, as he grew to manly size, he learned he could more than hold his own with others in rough sports, in feats of strength, and also in storytelling.

James Gentry, a storekeeper, asked Lincoln to take a flatboat of produce to New Orleans. Nineteen year-old Abe accepted the responsibility of the hazardous trip. With him went Allen Gentry, son of James.

Near Baton Rouge a band of lawless Negroes jumped them while they slept. Abe's strong arms tossed them off the boat one by one.

We drove to Rockport, a town perched pleasantly on high banks of the Ohio, and saw the spot where the momentous flatboat trip began. A towboat pushing six barges churned by while we watched.

In a city park near by, the Lincoln Pioneer Village fascinated us. Designed by George Honig, 14 reconstructed cabins are arranged in the form of a village. Among the replicas are the Lincoln home itself (pages 142, 163, 165); the Old Pigeon Baptist Church, which Tom and his son helped build; the home of Azel Dorsey, one of Abe's schoolteachers; a pioneer schoolhouse with dirt floor and fireplace benches; the Jones store, west of Gentryville, where Abe clerked for a while; John Pitcher's law office, to which he often walked 17 miles to borrow books; and the home of Aaron Grigsby and Sarah Lincoln Grigsby, where Lincoln's sister died in childbirth after a year and a half of marriage.

In 1844, as a rising young prairie lawyer, the future President revisited Gentryville and Rockport while campaigning for Henry Clay. Familiar scenes brought to his memory the sad occasions of his youth, and he penned these verses, part of a longer poem:

> O Memory! thou midway world
> 'Twixt Earth and Paradise
> Where things decayed, and loved ones lost
> In dreams shadows rise . . .
>
> I range the fields with pensive tread
> And pace the hollow room,
> And feel (companion to the dead)
> I'm buried in the tomb.

Other poems of Lincoln's are on view in an exhibit at Santa Claus. We spent a delightful half-day exploring Santa Claus Land in midsummer. Louis J. Koch, philanthropist owner, said nearly as many visitors stop in the hot summer months as in November and December. "Attendance now is up to 575,000 adults and children a year," he told us.

Mr. Albert J. Wedekind of Dale, member of the State Highway Commission of Indiana, mapped a trip for me showing Lincoln's route to Vincennes. Traveling the hilly terrain through woods, farmlands, and over a section of strip coal mining, we saw occasional Lincoln National Memorial Highway signs.

The family moved to Illinois in March, 1830, a few weeks after Abe's 21st birthday. His father could not resist the glowing tales of fertile land along the Sangamon. He knew Abe had worked hard in Indiana. They had set left to an unbroken forest. Abe "had an ax put into his hands at once; and from that till within his twenty-third year he was almost constantly handling that most useful implement."

Taught to Work, but Not to Love It

He was a dutiful son, turning over to his father his earnings as a hired man among his neighbors. He told one of them that his father "taught him to work, but he never taught him to love it."

The work Lincoln loved was not of the type to be appreciated by his frontier neighbors—poring over books, laboriously spelling out the words by firelight, walking miles to borrow or return a volume. But a few knew the difference.

Once a passing farmer and his son saw Abe reading a book in a field while letting his plow horse rest. The father said, "Son, look at that!

boy. He will make a mark in the world. He either works or reads. He never wastes a minute."

So the boy that Kentucky created and the man that Indiana fashioned was given to Illinois. He ferried the Wabash, driving a covered wagon pulled by a yoke of oxen. He [illegible] gether too short," and moccasins. From no lower he must have looked back and marveled again at Vincennes Cathedral.

We lingered two days in Vincennes while the children's poison ivy was being treated, and absorbed the history and charm of this French-American city where George Rogers Clark saved the Northwest Territory for the United States during the Revolution.

Then we crossed the Wabash on the Lincoln Memorial Bridge and edged into the prairies of Illinois.* The Lincoln National Memorial Highway, here well marked, turned right and followed the "inside road," the one nearest the river, to Palestine and Hutsonville. Cornfields filled the bottomlands. Big red barns, white houses, and well-kept lawns green from recent rains dotted the roadside.

North of Palestine we missed a turn on a grassy road. A young farm wife in a big truck drove two miles out of her way to lead us right.

A lumbering, creaking covered wagon carried the Lincoln party along this road in March, 1830. In it rode Sarah, Abe's stepmother, the Kentucky widow whom Tom Lincoln had married after Nancy Hanks died. Completing the party of 13 were Sarah's son, her two daughters, their husbands, and their children.

One of these husbands, the "irrepressible" Dennis Hanks, gave as a reason for moving: "I'm going to git out o' here and hunt a country where the milk sick is not; it's like to ruined me." He lost several cows and calves in one week of a renewal of the scourge and suffered the sickness himself.

Flat Prairies Amazed Pioneers

The pioneers, none of whom had ever been out of hilly country, must have been amazed at the levelness of the almost treeless prairies and the blackness of the soil.

River bottoms lined with trees reminded them of home. After two weeks of traveling, Abe and his parents chose a spot on the north bank of the Sangamon River about 10 miles southwest of Decatur. There they built their first cabin in Illinois and cleared some land.

To us, following the 121-year-old trail there were many high points before reaching the Sangamon. Rows of electric pumps working in cornfields were giving farmers a crop of oil as if the surface richness were not enough. We saw field after field of leafy soybeans, flourishing import crop from Asia. In soybean production Illinois leads the 48 States.

Between Marshall and Charleston most of the distance is a hard-packed earth-gravel road. We stopped in Marshall for directions. "How do you get to the Westfield road?" I asked a filling station attendant.

"You surely don't intend to go over that road!" he gasped, as if I were at the brink of Niagara in a barrel.

"I want to unless it's impassable."

"It's awful rough. I'd go around through Paris if I were going to Charleston."

Rainstorm Floods Fields and Roads

We disregarded his advice and stayed on the Lincoln trail. A black storm approached as we left the town and committed ourselves to the dirt road. Soon rain was falling so hard that it seemed we might actually be dropping over Niagara in a barrel. We crawled through Clarksville in midafternoon dark, barely able to make out the shuttered houses through the solid downpour.

In the fields, spaces between corn and soybean rows were miniature rivers. Stream beds filled and overflowed. At each culvert water ran across the road. We slithered through, never stopping to allow the wheels to settle in the mud, and reached Charleston just at nightfall.

Seat of Coles County, Charleston has many Lincoln associations. Tom and Sarah moved to Goose Nest Prairie, in the southern part of the county, after one year at the Sangamon River location. Abe may have lived with them a short time on their first Coles County farm. Later he visited them several times at other locations in the same community. He often traveled through Charleston during the twenty years he rode the circuit of the Eighth Judicial District.

Just before his first inauguration, Lincoln visited his stepmother, then a widow. There had been a strong bond between the two since the day his father had brought the new bride into the Indiana clearing. Sarah realized Abe was different from her own children and did her best to understand his needs. Unlike her husband, who scoffed good-naturedly at "education," she encouraged him in his efforts.

Shortly before she died, Sarah Bush Johnston Lincoln said of Abe: "His mind and mine—what little I had—seemed to run together. He was here after he was elected President. He was dutiful to me always. I think he loved me truly. I had a son, John, who was raised with Abe. Both were good boys; but

* See "Illinois, Crossroads of the Continent," by James B. Wood, NATIONAL GEOGRAPHIC MAGAZINE, May, 1961.

Illinois's Old State Capitol, Revived by Lincoln, Still Stands in Vandalia

[illegible]

Visitors Stroke the Lincoln Nose, Keep It Shiny

[illegible] Springfield [illegible]

[illegible] early [illegible] the [illegible] said, "We [illegible] we [illegible]"

William H. Herndon, the late President's law partner and early biographer, asked Dennis how he and Lincoln [illegible]. Dennis answered, "We [illegible] light, [illegible] and [illegible]. We [illegible] and [illegible] over and over the [illegible] and [illegible]."

Across the Charleston fairground we came to the site of the fourth Lincoln-Douglas debate, September 18, 1858. [illegible] working [illegible] Here, 25 years after passing [illegible] as a poor immigrant, Lincoln [illegible] as a candidate for the U.S. Senate. The [illegible] in [illegible] place [illegible] like the [illegible] Stephen A. Douglas.

Lincoln lost the Senate race to Douglas, but in the debates he established many points which helped him win the Presidency two years afterward.

Tom Lincoln settled in [illegible] 8 miles south of Charleston. We drove across Goose Nest Prairie to the [illegible] now preserved in Lincoln Log Cabin State Park. The [illegible] of [illegible] which the old pioneer saw here but never realized for himself was [illegible] about us in yellow seas of wheat and green fields of corn and oats.

I found [illegible] that Abe [illegible] I ever [illegible]

Another [illegible] associated with Abe of many [illegible] near the present [illegible] of the [illegible] Charleston. [illegible] Lincoln [illegible] Abe [illegible]

Heads of water [illegible] the [illegible] around the Charleston square that day. The rain we had [illegible] brought [illegible] we learned. Farmers could not work their [illegible] fields, so they came to town to [illegible] and talk about the unseasonable weather.

Looking Lamp, Young Abe Spent Hours in Study Beside a Blazing Fireplace

The cabin at Rockport, Indiana, duplicated [illegible] Rockport, Indiana, Abraham Lincoln and Thomas [illegible] sleep on a wooden trivet suspended [illegible]

As we drove northwest through Mattoon, Sullivan, Lovington, and Lake City to Decatur, the streams we crossed were [illegible] and the rivers rising. Ten miles west of Decatur we turned south from U. S. 36 to see the site of the first Lincoln cabin in Illinois, the point where the trek from Indiana ended, and found the Sangamon out of its banks.

Decatur is surpassed only by Springfield [illegible] the Lincoln National Memorial Highway. A big industry is the A. E. Staley Manufacturing Company, processing corn and soybeans into many products.

Split Rails for a Pair of Pants

When the Lincolns arrived here in 1830, Abe was less than a year old. A [illegible] recorded a pair of new trousers. He got 40¢ [illegible] for each yard of the material.

Thirty years later, in Decatur's Wigwam Convention Hall, John Hanks brought several rails "from a lot of [illegible] made by John Hanks and Abe Lincoln." The state Republican Convention immediately made the humble Rail Splitter its [illegible] for the Presidential nomination.

The Lincolns' first winter in Illinois was remembered for years by old-timers as the bad winter of 1830-31. Successive snowstorms covered the prairies four feet deep. Cattle died in the fields. [illegible] were pinned on unmilled corn [illegible] to death. The Lincolns and other newcomers who had no resources [illegible]

In February a trader named Denton Offutt [illegible] Abe and two kinsmen to take a flatboat to New Orleans. When the snow went [illegible] the trio found Offutt drunk in Springfield and no boat. They built their own craft, Offutt provided the cargo, and they ran down the Sangamon, Illinois, and Mississippi Rivers to New Orleans.

Lincoln and hands started the long float when [illegible] on the sandbars at New Salem. While extricating it, Abe had a chance to look over the new log cabin village on the bluff. When he returned from New Orleans, he came to live with his family and, at the age of [illegible], started out on his own. His destination was New Salem.

Lincoln canoed from near Decatur to his new home. Part of the route retraced his flatboat trip earlier in the year and later was the scene of his heroic exploit the *Talisman*, first and only steamboat ever [illegible] the Springfield vicinity.

To capture the flavor of boating on the Sangamon, I arranged to canoe from near Springfield to New Salem. Eugene Davison, Springfield lawyer, and I set out early one Sunday morning in his Old Town craft, glad that Lincoln's footsteps here changed to paddle tracks to give us an excuse for canoeing. The normally slow-moving stream was high, and the speed of its current matched that of eastern and northern rivers I had canoed on.*

We followed Lincoln too literally. Just as his flatboat had piled up on New Salem's milldam, the Chinquapin Bridge brought about our downfall.

"Watch out for the low bridge ahead," I called back to Gene at the stern.

"We can make it," he said. "I'm worried about the bridge downstream near Salisbury."

I didn't get a chance that day to worry about the Salisbury bridge. In spite of our last-minute frantic maneuvers, we hit a low beam of the Chinquapin span. The current rolled our canoe out from under us, leaving us ignominiously hanging in the water from the understructure of the bridge.

One Upset Recalls Another

We scrambled to the roadway and watched the capsized canoe, camera bags, and other gear float out of sight. Through my feeling of utter frustration crept the thought that it was near this spot that Lincoln, while building the flatboat for Denton Offutt, rescued two upset canoeists from the flooded Sangamon.

After recovering the canoe and some of our equipment later that day, I rejoined my family on terra firma and drove to New Salem. We walked along the one street of the reconstructed village, past the log homes and shops of the people among whom Lincoln achieved his first successes in public life.

"That Lincoln feeling is strong here," said Judith. "You can almost imagine him walking around."

[illegible] exclaimed Mary Ellen. [illegible]

I gave a start. Sure enough, striding easily along the grassy lanes, ax on shoulder, was a giant figure of a man. We followed him into the Lincoln-Berry store and found that he was Harlington Wood, Jr., dressed for the part of Abe in the historical play *Forever This Land* (pages 175 and 177).

As we strolled about New Salem State Park that afternoon, we also saw Ann Rutledge, Jack Armstrong, Jack Kelso, Chief Black Hawk, and other characters in the Kermit Hunter drama. Among the carefully reconstructed cabins, the make-up and costumed actors lent the final touch of reality.

The future President lived in New Salem six years, from 1831 to 1837. The town itself did not live much longer, a fact that has caused one historian to wonder if it was "a providential place designed by a 'divinity that shapes our ends' to attract a wandering young rail splitter to settle there in order that he might find himself." The town was platted in 1829 and by 1835 had reached its peak of 25 cabins and 150 to 200 inhabitants.

In near-by Petersburg, Illinois, we visited gracious Fern Nance Pond, historian of the New Salem Lincoln League, to ask how and why the town disappeared so completely.

"When, in 1839, Petersburg, two miles to the north, became the county seat of the newly formed Menard County, New Salem's future was doomed. The county seat at once became the center of interest; there county business was transacted; there people went to trade.

"Many of the Salemites moved there, taking with them their dismantled cabins and reerecting them in Petersburg."

Mr. Henry E. Pond, like his wife an avid Lincoln "fan," added: "You know, one of the New Salem cabins is an original—the Onstot cooper shop, second cabin on the right as you walk into the village. I discovered it here in Petersburg, covered by weatherboarding. The League purchased it in 1922 and reerected it on its original site."

We talked Lincoln far into the night. Will fell asleep on the carpet. The Ponds showed me on a map the original part of Petersburg, surveyed by Abraham Lincoln while deputy surveyor of Sangamon County. They described the hard work and painstaking research that the New Salem Lincoln League and the State of Illinois put into the New Salem restoration.

"All the reconstructed cabins are erected on their original sites, with one exception," Mrs. Pond said. "That one was located according to findings based on extensive research and investigation."

Present Postmaster Lincoln's Successor

On July 4, Jean, the children, and I returned to New Salem with a throng of holiday visitors. The children rode the broad backs of a pair of oxen pulling a Conestoga wagon about the village (pages 172 and 177). We inspected the Lincoln-Berry store, now a post office bearing the name "Lincoln's New Salem." The present postmaster succeeded Lincoln, for there had been no post office at New Salem since 1836 when it was discontinued and moved to Petersburg.

We visited the Offutt store, where Abe

* See, in the NATIONAL GEOGRAPHIC MAGAZINE "Down the Potomac by Canoe," August, 1945, and "Down the Susquehanna by Canoe," July, 1950, both by Ralph Gray, and "Labrador Canoe Adventure," by Andrew Brown and Ralph Gray, July, 1951.

Lincoln Shrines Dot the Hills of Southern Indiana, Where Abe Lived 14 Years

[illegible]

Roadside Day Lilies Frame the Blue and Distant Knobs in Kentucky's Lincoln County

[illegible]

[illegible]

Abraham Grew So Tall He Had to Stoop to Enter His Cabin

[illegible]

Bronze Hearth and Still Logs Enclose Hallowed Hospice Soil. Here Lived Abraham Lincoln Here Died His Mother

Nancy Hanks, Wife to Pioneer Drudgery and Illness Died Here

The Gray Children Climb a Rail Fence in New Salem State Park, Illinois

A Grassy Mall Leads Pilgrims to the Wooded Knoll Where Nancy Hanks Rests

New Salem, Illinois, "Legislator Wallansburg," Memorializes Young Abe and His Pioneer Times

Fancy Gadget: Ralph Gray Copies Abe's Favored Posture for Reading under a New Sidewalk Shade Tree

[illegible]

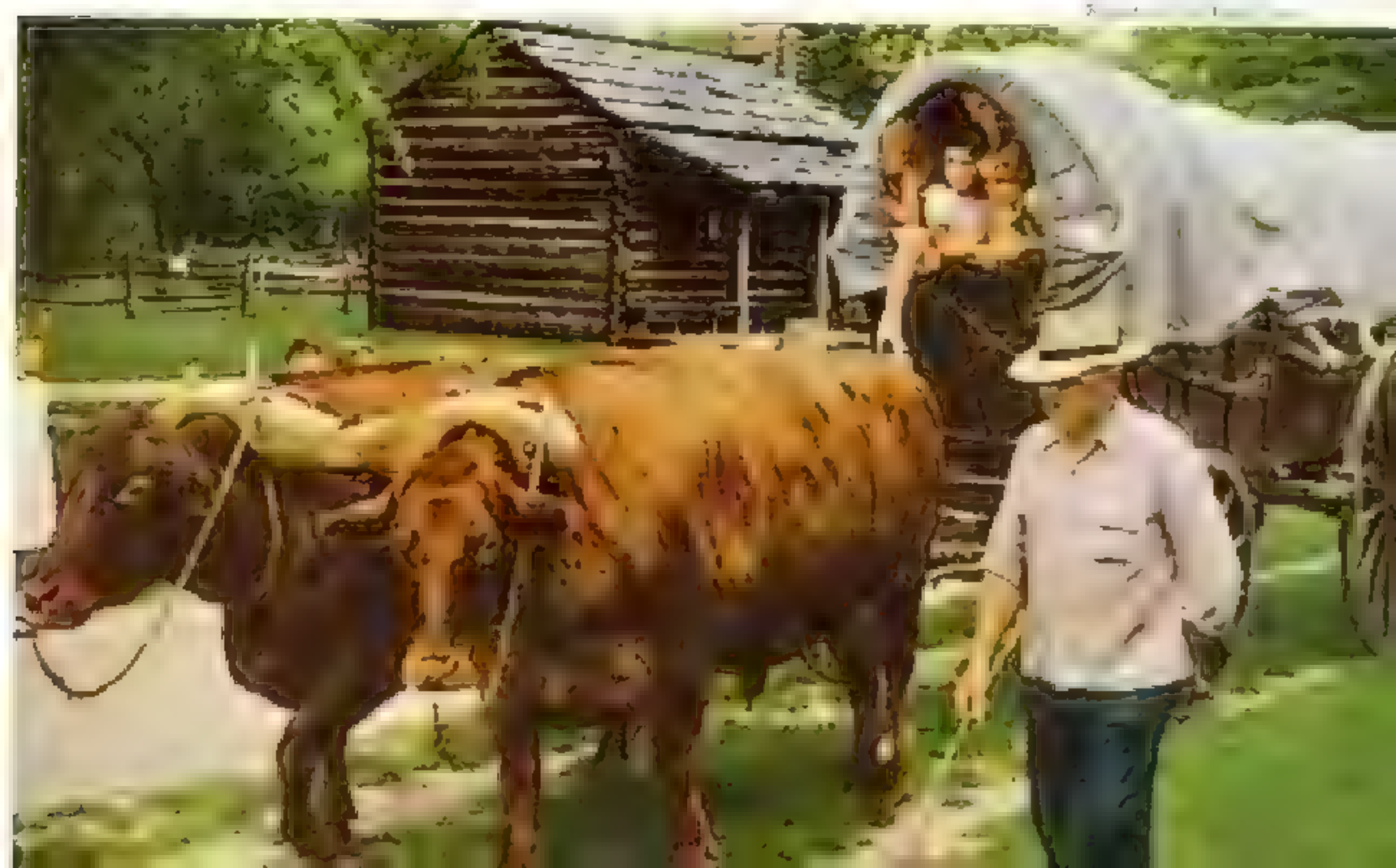
Lincoln's Springfield Home Appears Sumptuous Compared with New Salem's Logs

Abe Lincoln, Peacemaker Stops a Fight and Protects an Indian

[illegible]

Pete and Repeater, New Salem Boys, Give Children a Daily Treat

[illegible]



Springfield—"Here I Have Lived . . . and Have Passed from a Young to an Old Man"

Father Abraham Sleeps in Springfield Close to His Wife and Three of Their Children

Log Cabin, Grave, Obelisk, the Lincoln Story Lives in a Springfield Cemetery

clerked at his first New Salem job. Offutt's boasts about his clerk's prowess as a "rassler" brought about a match with Jack Armstrong, champion of the Clary's Grove Boys. Abe threw him, then was menaced by the entire gang. He backed against a wall, prepared to defend himself, when Armstrong rose and shook his hand. They remained fast friends.

On a bet, Abe lifted a barrel of whisky and drank from the bunghole. He spat out the liquid. Lincoln never drank, swore or indulged in the usual frontier male tradition. He studied Kirkham's *Grammar* by the light of wood shavings in Gaston's cooper shop, next door to the Gaston cabin home (page 173). He discussed Shakespeare and Burns with light-hearted Jack Kelso. He studied with Mentor Graham and joined the village literary and debating society.

"My Politics Are Short and Sweet"

In 1832 Lincoln announced himself a candidate for the State legislature. His reputed [illegible] Abraham Lincoln. . . . My politics are short and sweet, like the old woman's dance." His closing appeal was: "If elected, I shall be thankful; if not, it will be all the same."

The Black Hawk War interrupted his campaign. He lost the election, but in New Salem precinct Abe polled 277 votes against 7.

Lincoln saw no action in the "war" against Chief Black Hawk of the Sac, who had brought his people east across the Mississippi. The Clary's Grove Boys had thrown their weight behind Abe and elected him captain of the New Salem company of volunteers, an honor that gave him "more pleasure than any I have had since."

Later, on the floor of the House of Representatives in Washington, Lincoln made light of his military service. He said he was unsuccessful in "charges upon the wild onions" and that he had "many bloody struggles with the musquitoes."

During his three short enlistment terms, he walked or rode over a great deal of northern Illinois and into southern Wisconsin. He met and talked with Maj. John T. Stuart, a lawyer from Springfield, who was later to take him on as junior law partner. Stuart told him that if he were interested in law he should read Blackstone's *Commentaries*.

Back at New Salem Lincoln became an indifferent storekeeper. When business was slack, he lay on his back under a shade tree outside his store, feet propped high on the trunk (page 174). He read, and as the sun moved he moved with it to keep in the shade.

One day in Springfield, Lincoln bought at auction Blackstone's *Commentaries*, the one work necessary to an aspiring lawyer. He studied it, neglecting his store. His business ventures finally "winked out," leaving him saddled with a debt of $1,100.

On his second try, in 1834, Lincoln was elected to the legislature and went to Vandalia, then the capital of Illinois (page 161), for the first of four successive terms.

He was one of the "Long Nine" of Sangamon County—nine Whigs averaging six feet tall—and he led them in the successful campaign to move the capital to Springfield, their county seat.

It was while living in New Salem that Abe knew Ann Rutledge. When the young woman died of "brain fever," Lincoln grieved. Around these indisputable facts has grown a legend of romance that is known to every school child—a tradition that Abe buried his heart in Ann's grave and never was the same afterward.

My family and I visited the Ann Rutledge grave at Petersburg. Other pilgrims were there, heads bared. One read aloud the lines of Edgar Lee Masters as they are engraved on the huge stone:

> I am Ann Rutledge who sleep beneath
> these weeds
> Beloved of Abraham Lincoln
> Wedded to him, not through mere,
> But through separation
> Bloom forever, O Republic,
> From the dust of my bosom

"Everyone wants to believe the Ann Rutledge story," I was told by Dr. Harry E. Pratt, State Historian of Illinois. "New evidence comes to light occasionally, but the tradition still is not on solid ground."

Final Lap to Springfield

Springfield became the capital of Illinois in February, 1837. In April of that year, Abraham Lincoln, now a licensed lawyer, moved to the prairie town of 1,500 inhabitants.

We drove to Springfield over our final lap of the Lincoln National Memorial Highway. Across the flat lands we saw the greenish dome of the State Capitol Building.

Entering the busy city, we found the Sangamon County Courthouse. This yellow stone building of Greek Revival style, begun in 1837, was the State capitol for 40 years. Its chambers once echoed to Lincoln's voice pleading cases before the supreme court or addressing the House of Representatives. Here he spoke the thundering words: "A house divided against itself cannot stand . . . I do not expect the house to fall, but I do expect it will cease to be divided."

Five blocks southeast stands the comfortable two-story frame house which was the Lincoln home from 1844 until he left for Washington to become President in 1861 (pages 175 and 182). It was the only house

Springfield, 1860: the Tall, Weather-sidled President of Candidate Cheers Supporters at the Door to His Home

A Parade of Floats Streamed Past the Lincoln House

Indian Princess New Friend

Reverent Visitors Commune with the Martyred President in His Washington Memorial

[illegible] Washington [illegible] [illegible] Arlington [illegible] Virginia [illegible]

[illegible] the greater part of his married life with Mary Todd Lincoln, and where his [illegible] were raised, all but one [illegible]

Lincoln Home Preserves Favorite Rocker

[illegible] through the house [illegible] The great [illegible] favorite rocking chair [illegible] the Springfield house.

[illegible] Lincoln [illegible] walk the streets of Springfield [illegible] Many Springfield [illegible] Lincoln [illegible] Washington [illegible] George Washington.

However [illegible]

Having followed the [illegible] of Abraham Lincoln from his cradle to the grave, [illegible] to leave Springfield. [illegible] reports Lincoln's simple [illegible] words of farewell to [illegible] Springfield neighbors upon his 1861 departure for Washington to take up [illegible]

[illegible]

Man-of-War Fleet Attacks Bimini

Captive Invaders Reveal Their Remarkable Armament in Action for the Color Camera

By Paul A. Zahl

With Illustrations from Photographs by the Author

IT WAS late January, and I knew that the Gulf Stream, flowing northward between Bimini Islands and the Florida mainland, floated an enormous fleet awaiting the opportune moment to cast itself with full force against the nearest shore.

At 2 o'clock in the afternoon I had found a few battered craft thrown up on the beach of Bimini, westernmost outrider of the Bahamas (map, page 188). Now, 10 hours later, at midnight, I was bent on an espionage mission to determine whether more invaders might not be landing under cover of darkness. With the wind aflow and the moon half covered with streaming clouds, what better time for a landing assault en masse?

Spray from the pounding surf showered me as I made my way over the sand ridge and on to the dimly moonlit beach. I was almost oblivious of this wetting, for my senses were alert only to signs of landing craft. Here and there I again perceived some hulls half-buried in the sand, their rigging coiled about in wrecked disorder. But it was plain that the main attack had not yet begun; the big fleet was still offshore.

So I made my way back to my quarters, to be awakened some hours later by the sun of a bright tropical day. The force of the wind had diminished. I dressed speedily and retraced my course of the previous night.

Up over the ridge, down to the beach, and there, as far as my eyes could see, were the invaders, strewn by thousands upon the sand and stranded by the ebbing tide. In the surf a myriad more were being tossed and battered by the breakers. Bimini had been stormed by a vast armada of one of the most curious "dreadnaughts" on the high seas, the Portuguese man-of-war (page 190).

Tentacles Inflict Tormenting Burns

These long-tentacled creatures (*Physalia pelagica*) are members of that group of aquatic animals known commonly as jellyfish, technically as coelenterates. These include also the glamorous corals and sea anemones (pages 208 and 209). From the viewpoint of evolution they are among our planet's most primitive inhabitants, and their unique adaptations to the ruthless environment of the sea give them special status in the realm of Nature's fantasies.*

I had only a textbook knowledge of this strange blue creature, and so, after a preliminary tour of the littered beach, I hastened back to the Lerner Marine Laboratory for collecting buckets and jumbo-size tweezers.

Returning to the beach, I approached the stranded man-of-war with caution. Some of them were still alive. Dropped into a bucket of sea water, they immediately reacted to the familiar environment and, despite the limited space, actually began to lower their tentacles in an instinctive search for prey.

While gathering and manipulating the specimens, I could not avoid an occasional light hand contact with the tentacle tissue. For a few minutes I would feel no distress, but gradually a painful burning sensation would set in. For hours it kept me uncomfortably aware of the tentacle poison's virulence.

Down on the beach that morning I had noticed some small Bimini boys hopping from one man-of-war to another, each time causing the air-filled organism to explode like a damp firecracker. Had my hands been as thickly calloused as their foot soles, I too should probably have felt no stinging aftereffects!

Hoists Sail, Lowers Fishing Lines

In the laboratory I transferred my buckets of specimens to large tanks filled with running water. Through the glass walls I could observe the heavily armed man-of-war in complete detail.

The Portuguese man-of-war consists essentially of a thin-membraned bladderlike chamber crested on top by a narrow ridge of air sacs. These form a "sail" which can be raised or lowered at will, enabling this armless, legless, and finless marvel to travel before the wind.

The sail with its underlying hull may be as long as nine inches and as wide as five. It shimmers a diaphanous blue in the sunlight, with splotches of reds, delicate pinks, and lavenders (pages 190-192).

That portion of the hull which lies in contact with the water surface is thick and jellylike. In it are the digestive and reproductive tissues. From it extends a great pack of trailing blue tentacles which in the sea are

* See "Denizens of Our Warm Atlantic Waters," by [illegible] Mulle Miner, National Geographic Magazine, February, 1957.

Like a Hitchhiker on an Airplane's Wing, a Remora Rides a Gray Shark

[illegible] fish to snatch morsels from its meals. Their powerful [illegible] per hide, but a large remora may kill small fish by pulling away their [illegible] shark (Carcharhinus) lives in a [illegible] pen on Bimini [illegible] Smelling out his meal [illegible] kills fish to [illegible] a meal

completely submerged. [illegible] tentacles them to descend into the salty depths [illegible] far as 50 feet. [illegible] silent lure to unwary [illegible] invertebrates as well.

No attempt is made to seek out prey [illegible] fact, the tentacles are capable of only [illegible] motions up and down. But if a fish merely brushes one of the tentacles, a [illegible] harpoonlike hypodermics, microscopic [illegible] ing these long streamers, are instantly discharged to pierce its body, each injecting a tiny drop of poison.

The minute hollow threads do not withdraw, but cling. As the fish struggles, it getting more fouled up and thus receives additional hypodermic broadsides.

In a short time the finny victim is paralyzed. Up lift the tentacles, like elevators [illegible] catch to the man of war's eating tentacles for ingestion. Then down again they go for more lethal angling.

[illegible] shiplike the Portuguese man-of-war inhabits many of the global tropical seas. [illegible] in the Gulf Stream, where, during certain brief periods of the year, countless [illegible] suddenly appear riding high and [illegible]

Storms Wreck Man-of-War Fleets

Storm- and onshore winds are their [illegible] and a persistent blow may drive great fleets before it, wrecking and piling them up, [illegible] in Bimini on whatever beach, near or far, may happen ahead. Stranded, the [illegible] wilt and die as masses of ugly [illegible] jelly, familiar to anyone who [illegible]

Both Dog and Fish-shaped Porpoise Have Warm Blood and Breathe Air

[illegible]

[illegible] these [illegible] were [illegible] in the [illegible], and only [illegible], usually at late [illegible]. [illegible] no particular reason, [illegible] in the water.

Man-o'-War Have Submarine Concerts

Though [illegible] Never [illegible] few [illegible]. In [illegible] I was [illegible] D-Day when people [illegible] the [illegible] to [illegible] incredulously that the [illegible] was being [illegible] by Portuguese man-o'-war.

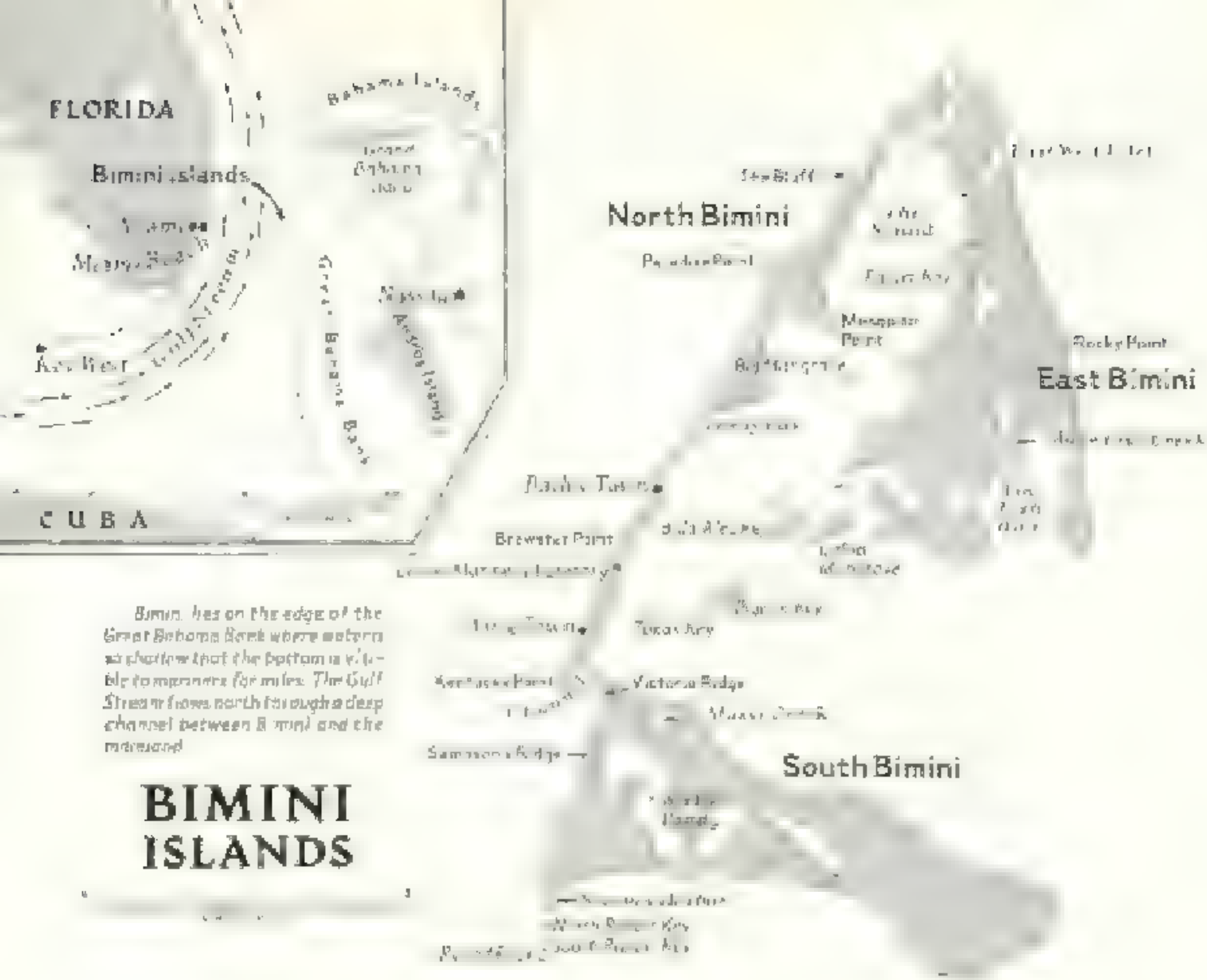
I [illegible] and a few [illegible] from the [illegible] in pursuit of the wind-[illegible] and [illegible] swept [illegible] beautiful [illegible].

Sure enough, they were there. The [illegible] through the sea [illegible].

With one hand on [illegible] and the other [illegible] a [illegible] man-o'-war to [illegible], [illegible] and [illegible] in a water-filled [illegible] pail.

Not for [illegible] about the [illegible] like a [illegible] bug. I [illegible] known as Nomeus gronovii [illegible] to live in close association with the Portuguese man-o'-war.

Although [illegible] in [illegible] this strange relationship, actually little is known about it firsthand. Here in the [illegible] waters of [illegible] was the chance of a lifetime to make some [illegible]



Bimini lies on the edge of the Great Bahama Bank where waters so shallow that the bottom is visible to mariners for miles. The Gulf Stream flows north through deep channel between Bimini and the mainland.

BIMINI ISLANDS

Bimini's Wedge Points North Like a Road Marker for Migrating Tuna

In summer big game anglers fish the Gulf Stream off Bimini for marlin and tuna. Bait fishermen work the lee formed by the slope sands. Only North Bimini is populated, its residents concentrated on the peninsula between Bailey Town and Alice Town. Miami Beach lies 55 miles west (insert).

observations on the nature of this enigmatic alliance.

I found what I sought. Hovering with apparent impunity among the treacherous man-of-war tentacles were *Nomeus* fishes, brilliantly mottled with blue and silver and with pockets almost winglike in size (page 193).

Some men-of-war harbored only one of these submarine escorts; others two, three, up to 15. Most of the fish were two to three inches long, but one relatively giant 8-inch specimen also found its way into my net.

Artful Dodgers Among Deadly Tentacles

I was curious to know how such fish survive a life among tentacles which are deadly to other fish. Do they have a natural immunity to the poison, or are they merely careful? Why have they chosen so strange a habitat? Does the Portuguese man-of-war protect them as a lure for other creatures? On what does *Nomeus* feed? On crumbs, perhaps, from the master's table?

In partial answer to some of these questions, which have remained debatable since the days of Agassiz, I found, for one thing, that the *Nomeus* fish is decidedly not immune to man-of-war's poison. Whenever I caught a man-of-war and its associate fish together in the same net haul, the latter would become panicky, flap against the tentacles, and invariably get stung. I would drop the entire catch into a pail of water, and within a few minutes all the fish would be dead.

On the other hand, if the net under a man-of-war was maneuvered so as to catch only its fish, these could survive indefinitely.

Clearly, *Nomeus* has a reliable technique for avoiding any direct contact with the poisonous curtain which night and day surrounds its tower. It's as if a man should live his life in a maze of high-tension wires whose touch would mean quick death.

The idea has been advanced that *Nomeus* may actually feed on the poisonous man-of-war tentacles, but we found no sights of tentacle tissue in the stomach contents of the fish, and now I knew from personal

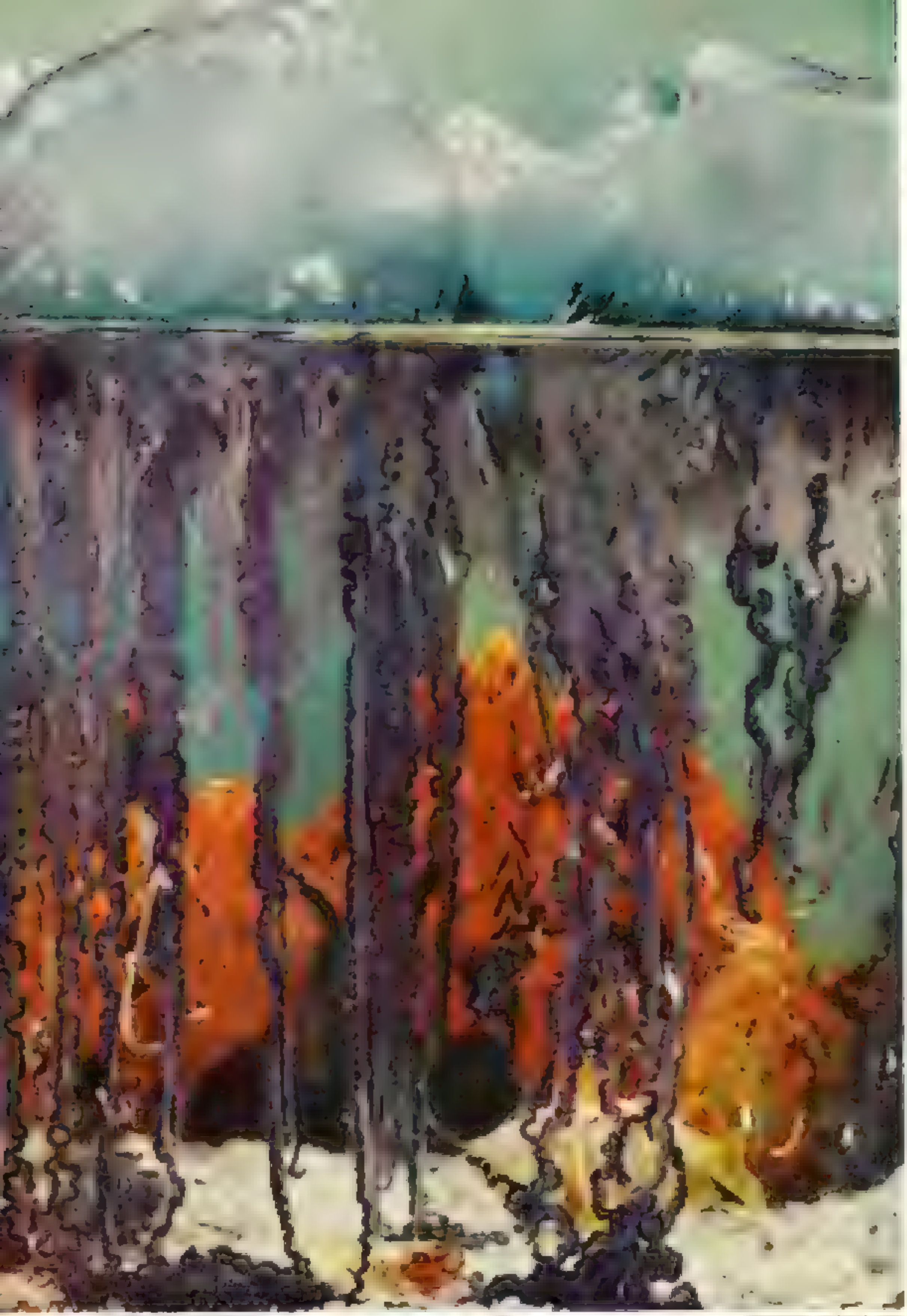
Horned Brow Gives the Cowfish a Bovine Look

[illegible]

Thousands of Portuguese Menial War Labor the Beach Beachhead after Invasion

[illegible]

Wary of Poison Tentacles, the Sailor Prodes Menaced Wait — Right: A Convoy of Eleven, and One Wrecked on the Beach



Deadly Draperies of the Men-of-War Entangle Two Careless Victims

[illegible]

Nature's Fishes Live and Dangling Death, Somehow Steering Clear of Harm

In one of Nature's strangest alliances, these butterfly [illegible] the [illegible] of the [illegible] Portuguese man-of-war. The author found [illegible]

For Research Purposes, Big Fish Are Penned in Bluegreen Bimini Bay

[illegible]

A Claws Ready, a Hermit Crab Guards Its Borrowed House of Shell

[illegible]

A Spiny Lobster, with Eyes on Stalks, Peers in Several Directions at Once

[illegible]

observation that the fish itself is highly susceptible to the poison.

One sea dweller that does apparently possess a natural protection or immunity is the loggerhead turtle. A skipper with years of experience in Gulf Stream waters tells me he has seen such turtles prey upon men-of-war. A turtle will close its eyes, he declares, and gulp the man-of-war whole. Still swallowing according to the captain, the turtle swims off with man-of-war tentacles streaming out of its mouth like weird holiday bunting.

Problems of the Parasite

Once having accepted a particular man-of-war as its food provider does a Nomeus remain faithful to that individual? This struck me as an especially intriguing problem in natural history.

When one large specimen in my dip net escaped overboard, I thought I saw it make a beeline for the organism from whose underside it had just been snatched. I doubt the significance of this observation, however, for that particular man-of-war also happened to be the closest at hand.

Consider in this regard, too, the thousands of these satellite fishes left safely behind in the surf when their mothers are tossed ashore during a blow. Do these thereafter live independent lives? Or do they seek out other men-of-war with which to join up? I believe the latter, although there is still no strong evidence to support my opinion.

The fascinating ideological problem of parasitism and animal cooperation, in all its multitudinous forms, is these days a major field of experimental biology. New facts of interest and usefulness are daily being uncovered by people trained in science working at such marine laboratories as the Lerner station on Bimini, where bizarre sea organisms conveniently throw themselves at the island or obligingly live almost at the laboratory door.

Happy Hunting Grounds for Scientists

A mere 50 air miles east of Miami Beach, Florida, Bimini is a tiny cluster of low-lying palm-studded islands enclosing a shallow bay through whose lucite-clear waters one may see quilted sea urchins, pearly lipped conchs, and gaily colored starfish lazing on the white sand bottom. The only populated isle is a splinter of land five miles long and but a few hundred yards in width.

To the west, Bimini faces that great arena of Western seas, the wondrous Gulf Stream.* [illegible] reaches the generally more quiet and shallow area known as the Great Bahama Bank.

In 1513 Ponce de León landed on one of the Bimini Islands and, so local legend says, bathed prayerfully in a fresh-water spring. It was a good test, for Ponce de León was already a middle-aged man. He stepped out of the pool with lined face and stooped shoulders unchanged and, disappointed, sailed off to search elsewhere for the fabled Fountain of Youth.

From then until the modern advent of the sportsman's yacht and speedy fishing cruiser now abounding in Bahamian waters, Bimini had a humble history, save in the era of prohibition in the United States; its inhabitants were victims of a not overrich soil and an isolation from primary trading areas. Today its citizenry consists mainly of about 700 Bahamian Negroes living in the quaint village settlements of Alice Town and Bailey Town.

From the British Government office at Alice Town, a Nassau appointed and most cooperative white Commissioner directs the civil administration. In recent years a group of American and Canadian families have erected spacious modern tropical homes on the tiny island, and several small hotels afford visitors comfortable accommodations.

During winter, spring, and early summer, sports fishermen from many parts of the United States, seeking sun and prize catches, dock their yachts at one of the wharves, anchor on the bay side of Alice Town, or fly over from south Florida resorts. Gathering on the docks of Bimini and along the King's Highway, they swap tall sea tales and conjecture on the probable location of big marlin and tuna schools.

Sea Creatures Aid Cancer Research

Constantly to the Bimini visitor is the sustaining and valued influence of Mr. and Mrs. Michael Lerner, internationally known big game fishermen.† In 1948, in collaboration with Dr. Charles M. Breder, Jr., distinguished biologist and marine authority of the American Museum of Natural History, they designed, built, and equipped a modern marine laboratory on Bimini and presented it as a field operation station to the American Museum.

Here to the Lerner Marine Laboratory come scientists from many parts of the world to carry on their researches in basic biology. More and more the technical facilities of the laboratory have been devoted to cancer research. Nearly half of all the investigations

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Greatest and Most Mighty Terrestrial Phenomenon in The Gulf Stream," by Rear Adm. John Elliott Pillsbury, August, 1932; "Treasure-House of the Gulf Stream," by John Oliver La Gorce, and "Interesting Citizens of the Gulf Stream," by Dr. John T. Nichols [illegible]

† See "Exploring Giants in the Humboldt," by Izaak Walton Burnham, NATIONAL GEOGRAPHIC MAGAZINE, March, [illegible]

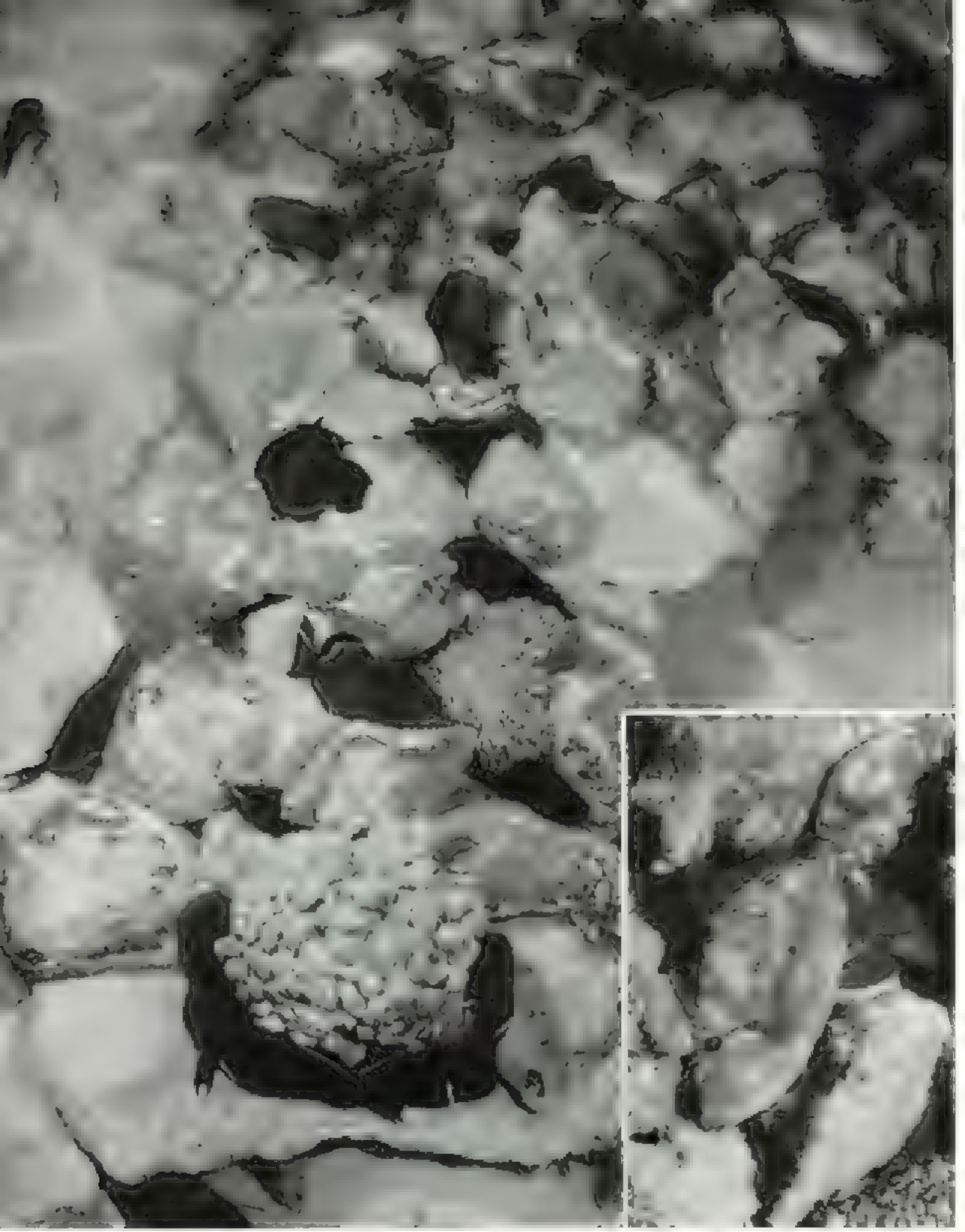
Bermuda Has No Cars; Its Only Highways Are Narrow Walks

This Big Blue Marlin Measures 13 Feet

[illegible]

A Sting Ray, Trailing a Barbed Tail, Dips Up to Be Fed

[illegible]



These First Lie Down to Sleep. Each Brilliant Coral Dweller Selects Its Bed

[illegible]

Seven Months Time Year from Their Migration Route to Florida's Fishermen

[illegible] dashing to the west [illegible] preserved two lines behind [illegible] accompany- [illegible] fish hole [illegible] formation and [illegible] power to find [illegible] route [illegible] for deep water [illegible]

[illegible] since the laboratory opening have been concerned with the cancer problem in one form or another.

Among the agencies that have contributed to cancer study at this laboratory are the Damon Runyon Fund, the American Cancer Society, and the United States Public Health Service.

Workers in this field have included [illegible] to Mother Sea, for it was in the sea that the earliest forms of life on this planet probably originated and the biochemical patterns of all living things were laid down.

The dread disease, found not only in human but in fish, plants, birds, and amphibia as well, poses essentially a fundamental biological problem in growth. Simple organisms taken from the sea constitute excellent material for the study of growth both normal and abnormal, and because these creatures multiply so rapidly, answers to technical questions can be obtained in hours compared with the years sometimes required in research with human subjects.

Life teems in the waters around Bimini and the research biologists find it well nigh perfect source of organisms on which to experiment, from huge mammal fishes all down

[illegible]

Sea Turtles, Flippers Trussed, Lie Upside Down on a Sailboat's Deck

[illegible] flippers

[illegible] Florida [illegible] Bimini [illegible] the [illegible] and [illegible] of game fishes such as bluefin tuna, blue and white marlin, [illegible], a variety of sharks, and other fast swimmers of the open ocean. In the [illegible] blue [illegible] waters of Bimini [illegible] are found an [illegible] variety and number of brightly colored reef fishes, crustaceans, [illegible] and [illegible] life.

The laboratory building and its adjoining [illegible] for visiting scientists are spacious and attractive (page [illegible]). They stand on [illegible] land straddling the narrow neck of North Bimini. At its front door is the tidal shallow bay and [illegible] a hundred yards to the west [illegible] the blue Atlantic.

The laboratory is [illegible] equipped for marine and [illegible] biology. It has [illegible] rooms, [illegible], and refrigerating rooms, [illegible]-temperature rooms, [illegible] and [illegible] with [illegible].

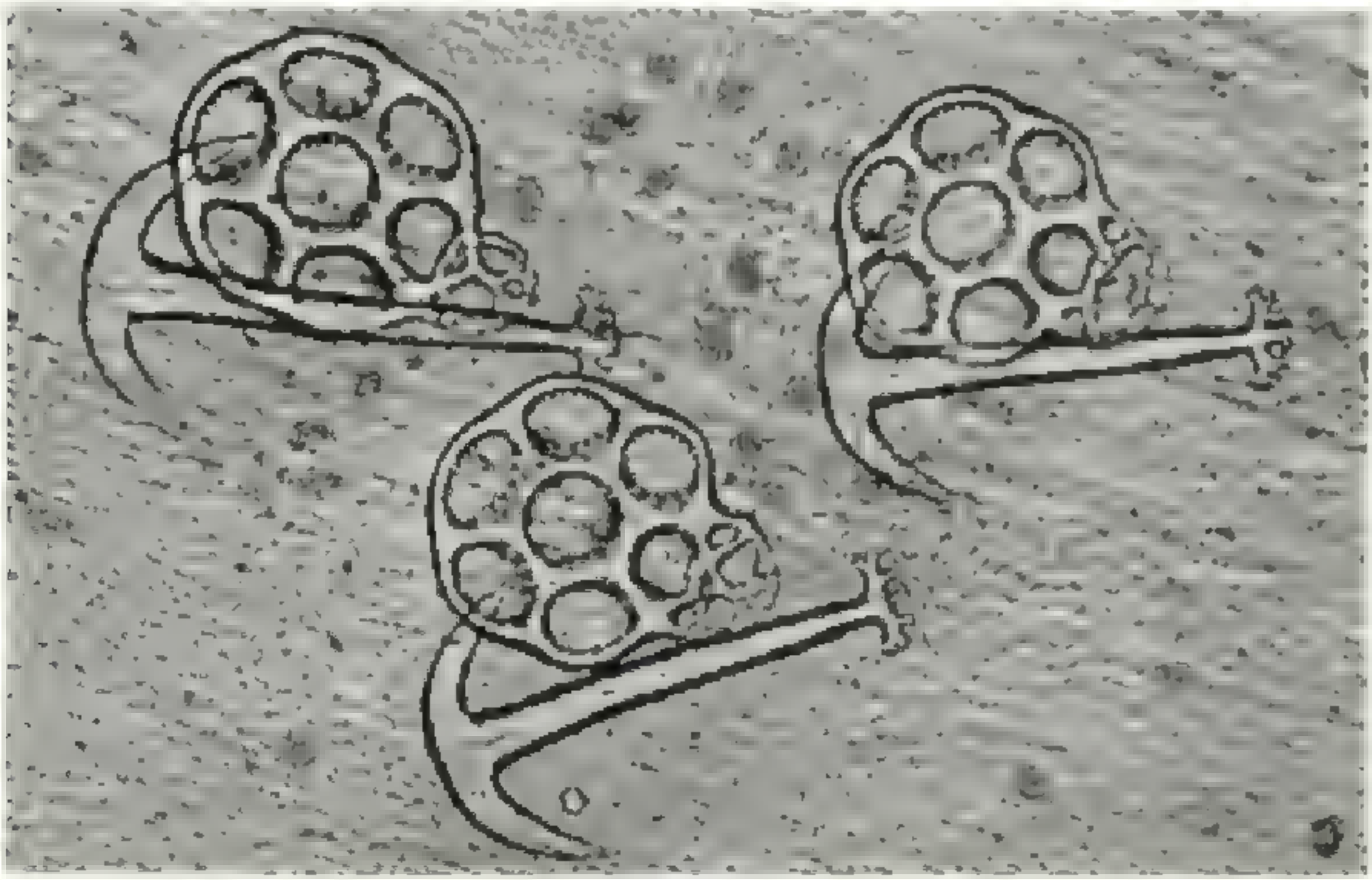
Island Captains Collect Specimens

On the staff of the [illegible] is an experienced [illegible] collector who [illegible] a fleet of [illegible] and [illegible] specimens [illegible]. Small and larger [illegible] are placed in aquariums [illegible] water [illegible] constantly [illegible] pumping system. [illegible] pens [illegible] for yet larger specimens. [illegible] are kept in [illegible] sweep [illegible] at the Lerner [illegible] dock, and are [illegible] of Bimini visitors (page [illegible]).

Under the directorship of Dr. [illegible] the laboratory has become one of [illegible]

Insects, Fleeing Light, Crawl Down These Cloth Funnels to Their Death

[illegible]



Nature Duplicates Ships' Anchors in Synapta's Tiny Anti-skid Hooks

[illegible]

which scientists dream, for here qualified investigators can work in the remote quiet and isolation of a small tropical island, yet are only 25 minutes by air from the facilities of Florida's Greater Miami area.

When the man-of-war invasion ended and the hot sun dried up the blue heaps of seaweed-strewn jelly, I found other absorbing subjects for my daily collecting trips.

Long "Ears" Give Sea Hare Its Name

On the far side of Bimini bay, opposite the Alice Town section, are shallows which, whenever the tide is low, turn into mud flats and tide pools. Here abound forms of marine life no less striking than the Portuguese man-of-war.

The sea hare, for instance, is a mollusk which during evolution has lost all signs of an external shell (page 212).

A mass of greenish-yellow jelly about the size of one's fist, the sea hare is decorated in ugly elegance with black leopardlike spots. At one end are two crinkle flaps of skin which look ever so much like rabbit ears; hence its descriptive name.

When disturbed, the creature is able to discharge a jet of purple fluid that diffuses eerily into the surrounding water.

Whether this is a "smoke screen" in which to hide from enemies or a toxic material with which to poison them is not yet clear. I hazard a guess that the latter is the case, for when sea hares were placed in a small aquarium containing fish, sponges, and coral, all but the sea hares died forthwith.

As I sloshed through mud and pools left by a receding tide, I saw brilliant orange-colored sponges all about; some were brick-red, with tiny chimneys through which they continuously "breathed" water.

Enormous black sponges may be several feet across. When overturned, they reveal themselves to be squatters' quarters for a dozen non-sponge species.

An ugly-looking brittle star extends one of its legs through a hole on a sponge's surface and then, sensing danger, quickly slithers it back. Worms with a thousand tiny feet coil and attempt to retreat unseen into some hidden crevice.

Marine Gardens Like Contrary Mary's

Flowerlike anemones abound (pages 208 and 209). Some are blue-gray, their Hydra heads alive with red-tipped tresses; others, like the sea cherry, are solid scarlet. Everywhere yellow, red, brown, and green starfish accentuate the sand bottoms.

The disappearing worm looks for all the world like a purple posy from Contrary Mary's garden. Its stalk is a tube coated with sand, out of which extends a most gorgeous display of purple fronds, actually the worm's gills (page 209).

One may see a garden of such fronds and stoop to admire it, when suddenly it disappears. All the worms have simultaneously swished their gills down into the protection of the tubes.

The reaction occurs at such lightning speed as to suggest that the garden may have existed only in one's imagination!

In wandering about Bimini's shallows, one must be careful not to step on sea urchins, for the common Caribbean species is a pincushion of deeply purple spines (page 209).

Nor may the urchins be picked up by hand, for needle-sharp spines can readily pierce one's skin, causing extreme pain and sometimes even infection.

Then there are the ugly sea cucumbers, whose name is their best description. Their [illegible] the Portuguese man-of-war, they have a curious consort. Living in the sea cucumber's intestine is a tapered, almost transparent fish about five inches long!

Of such is composed the countless variety of warm sea life.

Gripped by Myriad Tiny Anchors

My personal pet among Bimini's [illegible] is one that looks like a worm but is [illegible] closely related to the sea cucumber. It is about as thick as one's thumb and perhaps 12 inches long; but when disturbed it may stretch to be over a yard long and even break into several fragments, each of which, it has been reported, may become a new individual!

Having picked up the creature, you find that getting rid of it is quite another matter. You shake your hand, then grab at the worm with the other hand. But the creature's skin seems to possess a sticking power of remarkable tenacity.

Curious, I made some microscopic preparations of the worm's skin. There, magnified 150 times, was the answer (page 209). Thousands of tiny spicule structures, shaped exactly like ships' anchors, extended through the outer surface of the skin, each ready to attach itself invisibly to whatever material the worm touched.

The Governor of the Bahama Islands, Maj. Gen. Robert A. R. Neville, escorted by Mr. Lerner, came to visit the laboratory one day. General Neville, clearly an English gentleman of few words, took a look at the worm's tenacious anchors under the microscope and breathed but two passionate words: "Most extraordinary!"—an exclamation which well describes Bimini's family of grotesque sea children.

▲ A Red-clawed Rock Crab Pauses over a Sponge—but Not to Wash

[illegible]

▼ In a Patch of Sargassum Weed Lives a Camouflaged 5-inch Sargassum Fish

[illegible]

Nightmare to Crabs Is the Giant Tangerinia, with Pitless, Stared Eye and Voracious Maw

[illegible]

[illegible]

Pink and Orange Pearls Grow in Delicate Depths of a Caribbean Conch

Bright Animal Flowers Bloom on Banzai Bay Shallows

- A [illegible]
- [illegible]
- A [illegible]

Threats to Rare Feet Rocky-trap the Bay's Star-spangled Bottom

▲ [illegible]

[illegible]

▲ [illegible]

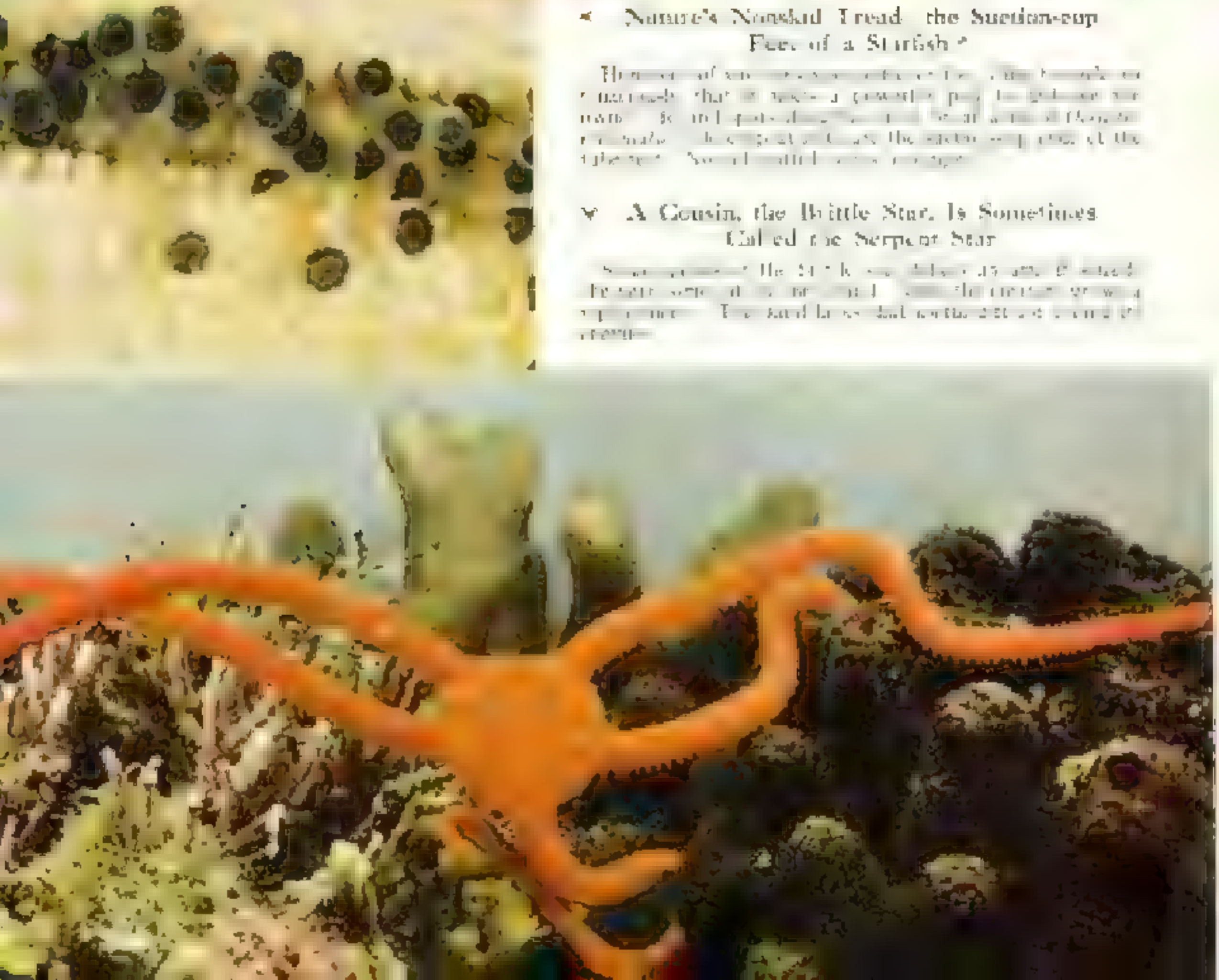
[illegible]

◄ Nature's Nonskid Tread: the Suction-cup Feet of a Starfish ►

[illegible]

▼ A Cousin, the Brittle Star, Is Sometimes Called the Serpent Star

[illegible]



Danger and Beauty Dot the Tidal Flats of Burma

Upper: [illegible]

Middle: [illegible]

Lower: [illegible]

A Sea Hare Shows Its Rubber Ears (Top) Another Source Large "Ears"

Yemen Opens the Door to Progress

American Scientists Visit Hitherto Arabian Land at the Invitation of Its King to Improve the Health of His People

By Harry Hoogstraal*

TODAY in walled towns and citadels in the mountains of southwestern Arabia several million people live as they have for centuries past. They dwell not in the Arabian desert of popular imagination but in teeming cities of architectural splendor; in deep, fertile valleys terraced from stream bed to lofty crags; or in great stone fortresses at the very peaks of the ridges or mountains.

Only in the last few years has Yemen decided to open, cautiously, its gates to a few official visitors, introduce the Machine Age to its younger generation, and cooperate with the United Nations.

Today, the three main cities have small power plants, and several schools train their children. A few jeeps and heavily laden trucks travel the steep, winding mountain trails. Ambitious projects for improving health, agriculture, water supply, roads, and ports are under consideration.

The Yemenis make no attempt to excuse their long isolation and the policy that has almost entirely excluded foreigners, for in a war-torn and avaricious world they have unified their tribes and preserved an ancient culture. They have long exported grain, hides, and, many agree, the finest coffee in the world. Now they are ready to import foreign experts and see what can be done for the improvement of the country.

King's Guests for Seven Weeks

As part of this new program, His Majesty Imam Ahmad bin Yahya Hamid ad-din, King of Yemen, recently invited Capt. J. J. Sapero, Director of United States Naval Medical Research Unit No. 3 at Cairo, Egypt, to send a group of specialists in different phases of tropical medicine to survey medical problems and to recommend controls.

We who were chosen comprised an epidemiologist, a parasitologist, an entomologist, a medical biologist, a bacteriological technician and a medically trained Egyptian interpreter. For seven weeks we lived as the King's guests. We examined hundreds of his subjects, collected thousands of mosquitoes, flies, ticks, fleas, lice, snails, and internal parasites, together with their animal hosts. We prepared large quantities of blood and fecal samples for studies in the naval laboratories at Cairo.

We studied the way of life in torrid, sandy coastal plains; in luxuriant middle altitudes, where crops and carriers of disease alike flourish; and in cool highlands, where ancient Arabic culture preserves its most impressive monuments.

A naval plane, loaded with laboratory and working gear, took us from Cairo to Aden, the tiny British colony at the southwestern end of the Arabian peninsula. There, in a sweeping harbor rimmed by old volcanic cliffs and craters, ships from around the world call to replenish oil and coal, to load Yemeni hides, coffee, and grain, and to off-load exotic souvenirs for the customs-free port.

On the fourth morning in Aden we arose long before dawn and climbed into three jeeps that the King had sent for us. Our gear had gone the day before, up the steep and rugged trail to 4,600-foot Taiz.†

Jeep "Coachmen" Ride the Bumpers

Our reactions to the drivers that first day were mixed awe, fright, anger, and admiration. But later we were to know them as remarkably capable and enduring. All were Italian-trained in Eritrea: tall, faithful Hatim, the oldest; fun-loving Ali, short and slight, quick to scream orders at frightened camels or dull-witted pedestrians; and another Ali, a wild racer but dependable.

The drivers were assisted by "coachmen," dust-covered boys who rode rear bumpers mile after mile, day after day, always alert to move rocks, wipe windshields, pour gasoline, haul frightened camels out of the way, or pick up people who fell off their mounts when the animals shied.

The rough, dusty trip of some 155 miles from Aden to Taiz took us about 10 hours. First we crossed a narrow strip of coastal desert, then climbed gradually up rocky slopes; several times we dipped into green valleys with swift little streams in their beds.

At last we drove into the courtyard of a medieval fort in which Yemeni customs officers were examining a half-dozen heavily laden new American trucks. Thus we knew we had crossed the Aden-Yemen border (map, page 216). The officials stoutly waved us on, and a few hours later we arrived at Taiz.

* The author is Head of the Department of Medical Zoology, U. S. Naval Medical Research Unit No. 3, Cairo, Egypt, and Field Associate in Zoology, Chicago Natural History Museum.

† See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Yemen—Southern Arabia's Mountain Wonderland," by Harlan B. Clark, November, 1947, and "[illegible] Arabia," by H. C. C. Swayne, December, 1[illegible]

Tall Houses in Santa Fe's Luxury Quarters on Top of Skyscrapers

[illegible]

Turbaned City Dwellers Laugh at a Foreigner's Straw Hat

[illegible]

[illegible] the "goat of [illegible] (pages 220-21). [illegible] [illegible] [illegible] with [illegible] [illegible]

[illegible] (page 222). [illegible] [illegible] [illegible] [illegible] [illegible] to drink and to pasture.

[illegible] [illegible] [illegible]

[illegible] [illegible] (page [illegible]).

[illegible] [illegible] [illegible] Yemen [illegible] [illegible]

Daggers [illegible] made [illegible] wood. An excellent dagger with a [illegible] handle costs less than [illegible] dollars. [illegible] the price ranges between $70 and $150.

Yemen Had World's First Skyscrapers

The Yemenis [illegible] the original builders of skyscrapers, and [illegible] in the claim.

At Sana our consul was housed in a [illegible] [illegible] the center of the city, and we [illegible] [illegible] [illegible].

The house, [illegible] had been completely cleaned and [illegible] for our coming. [illegible] [illegible] [illegible]

A long room on the fourth floor was

Yemen's Eastern Reaches Where No Boundary Exists Merge with Burning Desert Sands

Arrangements [illegible] is related in the Bible (I Kings 10). Other powerful civilizations flourished the Sabaean, their glories [illegible] the Romans to call the [illegible] of the world Arabia Felix [illegible] by Arabia. Western Yemen includes approximately 75,000 square miles and some [illegible] 3,000,000 people. Agriculture is the chief pursuit. There are no railroads.

neatly arranged with steel cots covered by fresh new bedding, a small table and chair next to each. There was even a hot and cold shower in the bathroom. In the mess hall, next to the dormitory, a long table with a tablecloth, English silverware, and bright Japanese chinaware held the excellent food prepared by the King's own chef.

On the second floor long lines of sick and healthy people came to be examined by Dr. Robert A. Mount, chief of the mission. [illegible] they gave their histories to Abdul Aziz [illegible] Effendi, our Egyptian interpreter and skillful, courteous ambassador of good will. Abdul Aziz had worked many years among the sick before the Egyptian Government assigned him

Canal Drivers, Preparing to Leave Taizz, Feed Their Grumpy Beasts by Hand

[illegible] the camel to [illegible] its burdens. [illegible] into the mouths of reluctant beasts. [illegible]

to work for the United States Army and Navy during and following the war, and he [illegible] both the Yemenis and what we needed to know.

[illegible] were given a complete [illegible] medicine when necessary. [illegible], even a few women were [illegible] to venture [illegible] treatment.

Snails Hunted as Disease Carriers

In our third-floor laboratory we investigated the [illegible] background of human diseases in Yemen (page 234).

Dr. Robert E. Kuntz searched for internal parasites of dozens of animals in the Taiz area and specialized in a study of the fresh-water snails which might be host to the dread fluke disease bilharziasis or schistosomiasis. This debilitating and often fatal disease, a scourge chiefly in the Tropics, is common in the jubilee altitudes of Yemen.

With his considerable background in the study of bilharziasis, Dr. Kuntz easily found likely-looking [illegible] in the [illegible] quickly determined [illegible] were actually infected, and set off to study the incidence of the [illegible] of the [illegible]. To [illegible] new [illegible] by [illegible] water in public baths to flush out the snails.

In another [illegible] of the [illegible] expert, Dr. Kuntz [illegible] to [illegible] to wriggling larvae—[illegible] fected in wells, public [illegible], and streams—to mature [illegible] then stuck each one on a pin for [illegible].

In the stable of the [illegible] field laboratory and [illegible] and [illegible] flies [illegible] and entered my [illegible] in the [illegible]. On my side, a Yemeni hoy stuffed rodents.

A Mountain Citadel Stands Guard over Ethiopia's Seat of Venerable Kings

[illegible]

Old Hoosiers Builds Houses of Thatch

[illegible]

A couple of years before our visit the Emperor of Ethiopia had presented two lion cubs to the King of Yemen. They were now a magnificent sleek pair of young adults, quartered behind none-too-reassuring bars in the courtyard of the King's harem. When we asked to photograph these beasts, the keeper unconcernedly opened the cages. We took to a high ledge with our cameras. After the pictures were taken, the keeper casually shooed the lions back into their cages.

Wild Animals Like Those of Africa

A few leopards still lurk in Yemen's hills. Yemen is separated from Africa by only the narrow trench of the Red sea, and its flora and fauna are largely African in derivation. In the highlands, however, one may find representatives of Asiatic, European, and Mediterranean plants and animals as well.

Legends of giraffe and lion persist in Yemen, and, indeed, in some places the grassland, dotted with low, flat-topped thorn trees, is remarkably reminiscent of East Africa.

We saw jackals slinking in towns or fields, and hyenas chewing on donkey legs that they had carried to caves high on hillsides. Graceful herds of gazelles could be seen on hills or even in cultivated fields at almost any hour. Hundreds of baboons ambled lazily across the same hills and fields in search of food.

The rodents, too, reminded us of Africa. Hares, here darker than the sandy-colored ones of the lowlands, darted parallel with our jeep by the dozens as we visited our traps at dawn each day. Dainty long-tailed gerbils, like little kangaroo rats, dug their holes under thorny bushes. Burrows of the common African grass rat opened on vertical slopes. In cultivated areas colonies of jirds, fat and friendly little rodents with black-tufted tails, raised havoc in the fields with their diggings, which resembled those of prairie dogs.

In rocky dikes that cut across fields live little black mice with sharp spines replacing hair on their backs. Like their relatives in Africa, they have a hide as tender as wet tissue paper, and we seldom got a perfect specimen with a complete tail.

The most fascinating mammal of all to us, the hyrax, lives in social groups in the rocky ledges of steep hillsides. The hyrax is a tailless, conylike animal about the size of a Belgian hare. In East Africa it is valued for its thick, soft fur, which is often made into rugs, but zoologists marvel at it as an unbelievably strange relative of the elephant.

Camels are used extensively to carry goods into the interior and to carry produce to markets and ports in Yemen. They take 10 days to make the 175-mile, 7,500-foot climb from the seaport of Hodeida to Sana, chief city of Yemen, but even so the transportation cost is less than the two-day haul by laboring, boiling trucks. Only the airplane is cheaper.

Light-colored camels of the lowlands and the huge black camels of the mountains are well cared for by their owners. Camel drivers are often wild-haired, scantily clad Somali inhabitants of the hot coastal strip, who contrast markedly with the neat, heavily robed, fine-featured, light-skinned Yemenis of the highlands. Only in the port of Hodeida are camels degraded to pull carts as in Aden.*

On the day before a caravan sets out, drivers throw a huge pile of *durra* (sorghum) stalks, about the size and shape of cornstalks, on the ground and place their camels in a semicircle around the pile, their massive noses and grinding jaws all within arm's length.

Then, sitting cross-legged on top of the stalks, a couple of men break the fodder into six-inch pieces, tie these into bundles with leaves, and shove the carefully made packages far down the camels' throats (page 217).

This remarkable procedure goes on until not a shred of the huge pile of durra remains. Unless the animals are hand-fed, the drivers insist, they will not eat enough to sustain themselves on the long journey.

Herds of goats maintain themselves in Yemen with far greater ease than camels. There are several handsome breeds, and skins of thousands of goats and kids are shipped to distant lands. Many kidskins, the American consul in Aden told us, go to Philadelphia tanneries.

Sheep are much less common than goats, and much scrawnier. The cattle, an isolated race of Africa's humped zebus, are often sandy colored, small, and rugged. Their meat is excellent (page 222).

Since every man of any status in the community must ride a fine Arabian horse, with servants trotting breathlessly behind, horse breeding is highly developed. Royal guards and cavalry are skillful at equestrian tricks.

King Deals with Manifold Details

During our stay in Ta'izz, Dr. Mount was received by King Ahmad on several occasions. The King is highly intelligent and deeply interested in modern progress for his people.

[illegible] the King [illegible] would stagger a man much younger than his sixty-odd years. It includes everything from requisitions for cleaning rags and light bulbs to international affairs, road building, justice, erection of buildings, and planting of trees along roadways.

Many messages come from all parts of

* See "Camels, Man's Humps, Grumpy Servant," in [illegible] Science, [illegible] September, 1942.

Expedition Members Search a Rocky Stream Bed for Insect Specimens

In Alaska's [illegible] Wall Tents have replaced [illegible] for the dry season. [illegible] mosquitoes. Bottom: [illegible]

A Twin Towers Flank a Gateway to Yemen's Walled City of Fabzz. Young Herders Drive Horned Cattle

Whitewashed Mosques Lift Gleaming Domes to the Sun in Taiz

Temperatures are moderate, pleasant 70 to 75° all year long. Mountain springs, covered (I south plaster lined chan [illegible] water for the city's 10,000 residents.

Southern Yemen's Rugged Mountains Guard Approaches to the City

[illegible]

↑ In Hodeida, Sweltering Red Sea Port, Men Wear Cool Knee-length Skirts

[illegible]

Trees Yielding the Famed Mocha Coffee Grow in Yemen's Cool Mountain Valleys

Coffee's beverage qualities were discovered in Yemen more than [illegible] years ago. Yemen Arabians grow most of the world's supply. The port of Mocha exported the beans, hence the name of the popular type.

Yemen by wireless, over as swift and efficient a system as we have ever seen.

The Yemenis pride themselves on having a democratic government. The lowliest inhabitants can and do approach high officials, often even royalty, and the vehemence of their arguments proves the tolerance of the ruling classes.

As in other Mohammedan countries, the legal system of Yemen is based on the Koran, the sacred book of Islam, and administered by well-trained men known as *qadis*, respected by all. A qadi wears a dark skullcap wound with a straight, wide band of white cloth. Each is educated in the advanced school at [illegible]

We also saw the King taking his constitutional each day at high noon—6 o'clock, or 6 hours after sunrise, by Yemeni reckoning. Some days he walked several miles; other days he rode a mule or horse, sometimes stopping to chat with his subjects lining the road.

A pair of jeeps with mounted machine guns preceded the procession, and for half a mile the road was lined with camel corps and cavalry, rifles smartly at attention or weaving [illegible] or riding King a mass of variously clad foot soldiers walked or did a dervishlike dance with waving daggers and chanting. Mounted soldiers followed the King (page 233).

Mocha Coffee a Royal Gift

When we left Yemen, the King presented each of us with 200 pounds of fine Mocha coffee. Dr. Mount received a staggering 400-pound load.

The King loves Ta'izz more than any other city in Yemen, better even than the more refined and sophisticated Sana, the permanent capital of his ancestors. Before the assassination of his father, Imam Yahya, at the hands of insurgents in 1948, the present King, then the Crown Prince, was governor of Ta'izz Province.

It is easy to see why a Yemeni would become attached to Ta'izz, even though it is smaller and less polished than Sana. Besides its exquisite natural and man-made beauty, the town enjoys one of the pleasantest climates in the world, the average daily temperature ranging between 70° and 75° Fahrenheit the year round.

From the impressive but not extravagant royal palace and guesthouse on a hill overlooking Ta'izz, the view of the city is dominated by the minarets of 16 mosques, including one for women. Most were rebuilt by 16th-century Turkish invaders (pp. 224-5).

Though Ta'izz impressed us more than any other city in Yemen, other areas which we visited had their own unique interest.

Hodeida, on the Red Sea, is the principal port in Yemen. Ocean-going vessels lie several miles offshore, and cargoes are consigned only to that location, not to land. Ships unload at sea into small dhows which then sail into chest-deep waters where burly Negroes unload them and carry the cargo to shore on head or shoulders.

A new, protected port 10 miles north of Hodeida, now under consideration, would materially benefit the commerce of the country. The historical port of Mocha is destroyed and sanded in.

Hodeida is divided into two districts, the city proper with stone buildings, and the outer village with grass shacks. On the roofs of the high stone or masonry buildings there are usually grass huts for sleeping during the long hot season (pages 219, 232).

Yemenis from the mountains, if they must come here, look upon it as a horrible, flat, unprotected place, and are always eager to return to their cool, walled highland towns. Indeed, the late Imam Yahya is reported never to have seen Hodeida. In summer the sweltering heat makes life miserable indeed, but in winter the weather is pleasant enough.

Thieves Tied to Loot and Exhibited

The crowded, noisy bazaar of Hodeida with its narrow, winding, covered alleyways is typical of many cities in the East. Except during the long siesta hours, the crammed shops and tea and coffee houses with blaring music are alive most of the day and night. Merchandise from the outside world ranges from English biscuits to Japanese crockery.

In the bazaar we saw a powerful deterrent to stealing. Two thieves, tied to posts and wearing the baskets, thermos flasks, and other paraphernalia they had looted, were exposed to public ridicule.

The lowland people are darker than highlanders. They show considerably more Somali and other African mixture, and their cultural patterns are much less uniform than those in the mountains. Unveiled women wear bare-midriff costumes, and men have knee-length skirts wound about their waists (page 226).

Both men and women often wear closely woven straw hats with narrow brims, as do many peoples of East Africa and the other southern Arabian lowlands. Some hats are extended to a high point.

The lowlands are largely desert, but a few miles inland wells supply enough water to raise durra, strong tobacco, and sweet potatoes.

In the desert around Hodeida we found many close relatives of the usual lowland animals of Africa. Scincus lizards, marvelously streamlined and shovel-snouted for rapid

Vaudeville Dancers and Veteran Princess Meet in Carpeted Ease at the Royal Palace

[illegible]

[illegible] shivering beneath the surface of the sand, were [illegible] dancers.

[illegible]

[illegible] of wet, powdered [illegible] pulsing to the [illegible]

I was not interested in his remark, but asked to examine the snakes. [illegible] I [illegible] the house. [illegible] power in [illegible] over [illegible] At the end [illegible] proposed the [illegible] hundred rupees [illegible]

Madame [illegible] the [illegible] and the performance had to be repeated. [illegible] however, [illegible] I

was magically protected, one of the snakes dug its teeth into a finger and drew a surprising amount of blood.

While I laughingly held the pose for the camera, the inevitable crowd of onlookers guffawed at the unhappy snake charmer whose efforts had so strikingly failed. We got the snakes at our own price, and the rabbit pellets were thrown in free.

Big and Little Birds Abound

Bird life in the middle altitudes impressed us most of all as we whizzed by the richest natural history of Yemen on the way back to the highlands.

In the lowlands we had seen our first pelicans of the trip, quietly fishing in a little seaside lagoon and taking off like slow, low-bellied hydroplanes at our approach.

Later we saw several immense, long-legged bustards standing on the ruins of an old fort. A flock of black-and-white Abdim storks flew gracefully away from the dura field in which they were feeding, and gray northbills with [illegible] jeeps, as red-winged blackbirds sometimes do in America. Gray shrikes went busily about their murderous business; peaceful doves cooked quietly among the stones of the road.

The iridescent little green bee eater was much in evidence, and the kaleidoscopic paradise flycatcher, its long tail trailing behind, flew from tree to tree. Another magnificently colored bird, the Abyssinian roller, with long, forked tail, sat quietly on low branches, scanning the ground for large insects. Over all a surprising variety and number of hawks and falcons kept watch.

After a night at the first resthouse, we had a breakfast of the usual yoghurt, fried eggs, bread, sweet lemons, bananas, and coffee. We had reached the famed hot water baths of Hammam 'Ali, elevation about 5,000 feet, only a five-hour drive from our goal, Ma'bar.

The impressive mayor of the area showed us through the stone houses built around large Japanese-style sunken bathtubs in which visitors were lying in the hot water to be cured of various ailments. He quietly boasted of the "match material" (sulphur) in the water that was the cause of the benefits.

By midday we had passed through more impressive mountains and cultivated valleys, topped an 8,000-foot pass, and after a short run across a barren, flat plain arrived at Ma'bar.

We had asked in Hodeida to be sent to one of the rich middle-altitude areas, in order to work where tropical diseases are rife. Through some misunderstanding, the place assigned us was at 7,400 feet, 2,000 feet too high, and on a barren, stony plain.

The extreme hospitality of the mayor, or *amil*, however, and his unceasing assistance in our work soon dispelled our disappointment. The amil proved to be one of the best-read people we had met in Yemen, with a wide knowledge of history and of other parts of the world. He had been the private secretary of the previous Imam.

In the resthouse at Ma'bar we enjoyed eating and sleeping in the fashion of the better-class Yemenis. Our table was a platform raised about a foot off the floor, before which we sat cross-legged on carpets, leaning on pillows in the best local style. Day by day, in deference to our curious habits, a little more silverware was added to the table, until at last we had a complete set.

Even in this small and comparatively poor community the food was excellent, and we were served far more than we could eat. Course after course of meats, with or without vegetables, was served before sweet lemons and wonderful coffee ended the meal. Arabian food is so thoroughly cooked that we had little fear of contamination.

A common dish consisted of a whole roast chicken per person, stuffed with fine rice flavored by almonds and raisins, and a whole hard-boiled, peeled egg.

A plate of several fried eggs, prepared much like Mexican *huevos rancheros*, was always presented, as well as squash stuffed with chopped meat, called *dolma*.

One of our favorite foods was *bint el sahn*, or "daughters of the dish." This was brought in, still sizzling hot, in enormous covered woven baskets.

Under the cover was layer after layer of very thin bread circles. The indigo-turbaned servant next brought in a pitcher of steaming melted butter and poured it generously over the top and between the layers. It was a delectable dish. Egg custard, then fruit, often followed as the tenth or twelfth course, and finally Mocha coffee.

A Lesson in Yemeni Manners

The floor of our sitting and living quarters was carpeted with small, thick, overlapping Persian rugs. Low carpeted platforms around the walls, lined with brightly covered pillows, served for sitting or sleeping.

In the cool highlands all Yemeni houses are arranged with carpeted, pillowed floor-level sitting places around the walls, but in the torrid lowlands the same arrangement is on high wide benches, some four feet above the floor to catch breezes from the windows.

Early in the trip, when seated on these benches, we noticed that a distinguished visitor frowned at our outstretched feet. After the visit, Abdul Aziz, to whom we turned for

Moving Day for a Hodeida Family: Camels Carry Women and Household Possessions

Gaunt, veil-clad women often [illegible]

Yemen's King Holding an Umbrella, Enjoys a Ride in the Country — Loyal Riflemen Guard Him

Members of the Medical Mission Prepare Laboratory Specimens

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] informed us that we were expected to tuck our feet to one side or under us. It was extremely bad manners to point them at a visitor!

Incense is frequently burned in ornate brass braziers in Yemeni homes. Scent is an important part of home life. Upon entering a house, the visitor notices a faint odor of rose or lavender water wafted about just before his arrival.

The better-class houses, made largely of mud and whitewashed brick, are all neat, clean, and well [illegible]. Whitewashed walls and ceilings contrast with richly colored carpets and bright pillows to give the room a pleasant air. Ceilings are made of closely spaced, gnarled [illegible] laid over and in between and whitewashed.

Windows are the [illegible] feature of a Yemeni house. They usually begin at about floor level and reach a height of four or five feet higher. Above the lower window [illegible] useful [illegible], is [illegible] for the thickness of a [illegible] plate glass.

Multihued beams of light coming through upper windows are one of our most vivid recollections of the beauties of Yemen. In some houses, in addition to glass windows, thin slabs of translucent alabaster are [illegible] in the wall.

Mocha serves as a central market place and a [illegible] stop on the route from Hodeida to Sana'a. The Yemenis refer to the people here [illegible] as "Bedouins." [illegible] however, roving people, for they tend their flocks or crops in distant valleys and seldom wander far from home. Crops in the highlands consist of [illegible] grapes, walnuts, [illegible].

Mountaineers Distrust Foreigners

These mountain people resembled [illegible] storybook pirates, with their wild hair and beards, [illegible] features, dark skins, and [illegible] open in the middle, revealing often hairy and hairy chests (page 247).

In these out-of-the-way places the "Bedouins," who seldom if ever see outsiders, believe that the coming of one means [illegible] to run. We were met with some suspicion and occasional open opposition when we went alone to a new village, but the pres

ence of an official escort always assured us of a pleasant enough reception.

Several miles from Ma'bar is a wide, fertile valley with a number of springs, but on the plateau itself water is obtained largely from immense stone cisterns. These catch much of the water that races over the hard ground during a rain.

San'a, Metropolis of Yemen

When we left Ma'bar after a 6-day stay, it took us only five hours to drive to San'a, the largest and grandest city of Yemen.

San'a's population is estimated at more than 50,000. Its people live in a three-mile-long city enclosed by a buttressed 20- to 30-foot-high wall with eight main gates. The city, situated on an almost flat plain at an altitude of about 7,500 feet, is surrounded by barren mountains (pp. 214, 238, 240).

The original San'a dates from pre-Islamic times. As population grew, additional villages sprang up. These were later enclosed by extensions of the wall, so that now the crowded city is composed of several walled areas.

When any of the few foreign visitors go for a walk, scores and often hundreds of good-natured onlookers gather and follow. We were sometimes surrounded by a dozen officers and policemen beating at the feet of the crowds with long, thin branches to keep them back. It always amazed us to see how close the whip bearers could come to the onlookers' toes without actually hitting them.

Pulley wheels over innumerable wells in San'a creak and groan all day as camels, cattle, or asses walk inclined paths pulling goatskin containers of water up from the wells and dropping them again for another load.

Yemeni children are exceptionally gay and playful. On any afternoon in any city or town, wild happy games of tag, skip and hop, or a local version of hockey, basketball, or English football continue until dusk.

Young girls of the poorer classes are seen out of doors less frequently than their mothers, but better-class girls rarely venture out of the house. Girls in families with whom we visited were invariably pretty, bright-eyed, lovable little people, and we pitied them their later life of veiled seclusion. The wives of the household we met only for medical consultation. On those occasions, they proved pleasant and eager conversationalists.

Men Kiss in Greeting

Whenever men of the lower classes meet, their long, varied, and stylized greetings and responses are accompanied by strong handclasps. The greeter kisses either his friend's hand or his own as a gesture that he means to kiss the hand of his friend.

When, however, a man greets another in a higher rank of society, kissing becomes so effusive that participants and onlookers are visibly embarrassed. The greeter kisses the hand, elbow, shoulder, and knee of the more noble person. The greeted person usually protests after the first two or three kisses, and the strength of his argument determines how much or how little kissed he will be.

When the higher classes meet, procedure is the same, except that it is more dignified and quickly accomplished.

On first day in Yemen we thought everyone had mumps or a severe toothache! Later we found the people were chewing leaves of the kat tree, a mild narcotic that is stimulating. Chewers drink large quantities of water, but the wad of leaves bulges their cheeks all afternoon.*

The habit seems to induce insomnia and a lack of interest in eating, except at the one meal of the day before the afternoon chewing session commences.

The growing of kat trees (*Catha edulis*) in the rich, well-watered volcanic soil of the cool tropic mountain altitudes is so lucrative, we were told, that even the valuable foreign-revenue-producing coffee plantations are giving way to it.

Early each afternoon the freshly plucked, young green leaves, still on their twigs, are brought into town encased in bundles of other leaves to keep them from drying out (page 242). After the inevitable bargaining over the price of any one of the four different qualities, the purchasers trudge happily homeward and begin their chewing.

Flag-decked City Honors the King

We arrived in San'a on one of the great festival days, the celebration of the accession to the throne of the present King (pages 239, 244). The city was bedecked with red Yemeni flags bearing five stars, which represent the five natural geographic divisions of Yemen, the five dogmas of Islam, and the five times a day that the faithful recite their prayers. A saber reminds the people of the years they struggled to defend their country and make it [illegible].

When we arrived at midday, we made our way through cavalry, camel corps, and horse-drawn mountain artillery of Italian vintage assembled for the festivities.

In the evening we were invited to sit with important personages in the square and watch comedy acts as we sipped glass after glass of

* See "Flower of Paradise," by Charles Mower [illegible], August, 1947.

[illegible] Uses of the United [illegible] NATIONAL GEOGRAPHIC MAGAZINE, February 1951.

Mocha coffee. Little explanation was required for us to understand the actors' shouted lines and funny antics, which either ridiculed the higher classes or mimicked the lower.

Applause Frowned Upon in Yemen

During an intermission a military brass band played native music and a few European military marches. As we listened and gossiped with our new friends, it slowly dawned that one piece the band was trying was "The Star-Spangled Banner."

A schoolteacher sitting next to us told us that they were playing the piece in our honor. We naturally clapped when our national anthem was finished, and in a moment or two the whole crowd joined in.

When we turned to the schoolteacher, we could see by his embarrassed look that he wanted to tell us something and yet dared not. At last it developed that Yemenis consider handclapping a despicable custom. They had, however, cooperated with us to show their friendliness.

This incident impressed us more than any of the many other demonstrations of Yemeni eagerness to be friendly and to be one with the peoples of the outside world.

In San'a we were entertained by Prince Abdullah, Yemeni Minister of Foreign Affairs (page 230). We sat first in a room furnished with chairs in Western style and ate as if at a banquet table at home. Later we retired to a carpeted, pillowed room of Yemeni style, and the party became more informal.

Prince Abdullah aroused my interest by telling about numerous streams in the San'a area which in his father's lifetime, 70 or 80 years ago, had been rushing rivers but were now completely dry.

During my own travels in Africa I had become much interested in the recent extensive desiccation of a large part of the continent. I wondered if the same drying process could be extending to these mountain areas of southern Arabia.

Some Dams Ascribed to Sheba's Reign

Yet in Yemen there is still an impressive quantity of water. It is all the more impressive when one compares the amount with the great lack of water in many parts of North and East Africa and in all the other areas of the Arabian peninsula. Bubbling springs are found almost everywhere, and many streams and large rivers flow through the deep valleys. The water table is usually high, and wells are easily sunk.

As in the mountains of East Africa, there are two rainy periods a year, early and late summer. During the dry season, the time of our visit, hillsides were comparatively barren, but valleys with their deep deposits of fine volcanic soil were fertile and blooming.

At present there are few dams in Yemen, but in ancient times there were many. Some of the greatest are believed to date from the reign of the Queen of Sheba. Among the King's projects for improvement of the country is restoration of old dams or construction of new ones.

Water conservation is extensively practiced by terracing every valley and many hillsides. I have seen most of the world's notable terrace systems, and none is more extensive or impressive than those in Yemen. One can hardly look anywhere in the uplands without seeing terraces.

Experts estimate that even now Yemen could support a much larger population than it does, and that with a scientific water conservation program the population could be increased many times.

Often Hailed in American Accents

Many Yemeni men emigrate to other parts of the world to work, and accordingly those who remain have an easy time finding wives. The men go to the Arabian oil fields, to Aden, to East Africa, especially Eritrea and the Red Sea coastal areas of the Sudan; to English and Welsh mines; and to work as sailors and firemen on ships. Numbers of Yemenis have settled in America, especially in the Pittsburgh area. We [illegible] old ex-miners or ex-firemen who had returned to the country of their birth to take up the ways of their forefathers.

We have no way of knowing the literacy rate in Yemen, but we were surprised at the number of men who could read and write Arabic. Every literate man carries a fountain pen in a little pocket beside his dagger, where keys, small knives, comb, razor, or other paraphernalia may be stored.

Now and then he pulls a small square of paper out of an inner pocket and, placing it in the palm of his left hand, writes a message, which he then folds into a small roll and hands to a runner for delivery.

A busy man may have dozens of these little messages hidden away in his clothing. One particularly impressed with the importance of the written word often carries, hour after hour, a piece of paper and an open fountain pen poised for instant use.

When our work in San'a was finished, the necessity for returning to Ta'izz and then to Aden in a Yemeni plane was met with considerable misgiving by some because of the large initials painted on the fuselage: AAB, meaning *Allah, Allah, bas*, or, roughly translated, "Allah, Allah, that's all!" But Allah granted us safe landing.

A Highlanders Gun Armed Like Outlawed Pirates

[illegible]

A Village Elder Greets a Visitor

[illegible]

Mud Walls Enclose a Garden Plot in Sana'a, Yemen's Premier City

[illegible]

Turbaned Warriors Shoulder Arms

[illegible]

Sun-drenched Minaret Tower above Jostling Crowds and Narrow Streets in Sana

[illegible]

Modesty Requires San'a Women to Hide Behind Dark Veils and Heavy Shawls

[illegible]

A Sam's Man Hurries Home with Straw-wrapped Bundles of Kit

Kneeling, in a Dusty Street, Women Sell Fuel Cakes Made from Animal Dung and Straw

A Young Youngster, Swathed in "Hand-me-downs," Celebrates a Royal Holiday

[illegible]

Our Universe Unfolds New Wonders

Multitudes of Heavenly Bodies and Clues to Creation's Riddles Are Found by the National Geographic-Palomar Sky Survey

By Albert G. Wilson

[illegible]

A NEW and exciting picture of our vast universe, revealing details never known before, is taking shape as the great telescopes of Palomar Observatory sweep the skies.

Out in the depths of space we are finding immense numbers of celestial bodies, great and small, near by and far away, in regions of the heavens previously unexplored!

At the same time we are discovering important new clues to the mysteries of how large the universe is and how it is put together, and to the intriguing question of whether it is expanding at incredible speed.

This new "portrait of creation" is based on the photographic maps of the heavens now being produced by the National Geographic Society-Palomar Observatory Sky Survey on a California mountaintop.*

In four years, in 1,870 photographic plates, the Survey will chart more than three-quarters of the entire sky, all that is visible from the latitude of Palomar. The photographs will be published in a Sky Atlas which will supply astronomers with enough material for a century of study (page 240).

Exploring the Unknown Sky

Though the Survey's four-year task of mapping the sky is only about half completed, the results already are giving us a new conception of the universe around us.

Now, for the first time, man can see what the universe is like for vast distances out in all parts of the sky visible from Palomar. The Survey photographs include objects whose light, traveling 186,000 miles a second, takes 500 million years to reach the earth.

Earlier, astronomers had penetrated even farther out, but only in a few scattered sections of the sky, about one percent of the total area. The rest of the heavens had been charted only for comparatively short distances outward. The remoter parts of the universe were largely unknown territory.

But now the Sky Survey is rapidly opening up these virgin regions. New discoveries on the Survey's photographs are turning up in tremendous numbers. We astronomers are as excited about these finds as geographers would have been in 1492 if Columbus had brought back aerial photographs of all of North America.

Telescopes Work Together

This large-scale mapping of the universe is made possible by the new wide-angle 48-inch Schmidt telescope-camera on Palomar, which can photograph a section of the sky as large as the bowl of the Big Dipper on a single picture. Each picture will record all the visible heavenly bodies out to an average distance of 2,000 billion billion miles!

The "Big Schmidt" telescope is working in close partnership with Palomar's giant 200-inch Hale telescope. Because the 200-inch can photograph at one time an area of the sky only a quarter the size of the full moon, it is not suited for mapping the entire heavens. Instead, its power can be used on objects of special interest found on pictures taken by the Schmidt, photographing both their images and the spectra of their light on a larger scale for further study (page 256).

Working as a team, the two telescopes are rapidly enlarging and improving the picture of the universe which astronomers gradually have pieced together over the years.

Knowledge of Universe Unfolds

Thousands of years ago, on the plains of Asia Minor, shepherds watching the heavens at night noticed that some of the points of light moved with relation to the others. Slowly it came to be understood that these wanderers were the planets, traveling along regular orbits. Next it was discovered that the planets circled around the sun.

Then it was realized that the sun was merely another star, like thousands of others visible in the night sky. Still later the astron-

* See "Mapping the Unknown Universe" by F. Barrows Colton, National Geographic Magazine, September, 1950.

Another Square of the Heavens Is Charted at Palomar Mountain, California

[illegible] as large as the star Hipparchus [illegible] Dark [illegible] in this chart show the [illegible] Observatory Sky Atlas. This map, [illegible] the heavens, will give a new picture of the universe [illegible]

[illegible] that the Milky Way, which we see as a band of light across the heavens, [illegible] Dim [illegible] Milky Way [illegible]

Hundreds of Millions of Nebulae

Finally, as telescopes became even more powerful [illegible] that the Milky Way Galaxy is but one of hundreds or millions of similar aggregations of stars [illegible] and gas scattered at tremendous distances all through the space around us. We [illegible] been [illegible]

[illegible] the astronomers invented a [illegible] known as the light-year, [illegible] which [illegible] miles [illegible] travels in one year—about six million [illegible]

The 200-inch telescope, [illegible] times as [illegible] Schmidt, has photographed [illegible] light years away.

Light from [illegible] on the way to the earth for a billion years. It [illegible] far back in the Pre-Cambrian Age [illegible]

[illegible] of the place compared with the [illegible] telescopes. We [illegible] may be entirely different, perhaps have [illegible] or may be [illegible]

Astronomical Artillery in Action

[illegible] Schmidt [illegible] a wide [illegible] which [illegible] of the right [illegible]

[illegible]

Stars Circling Above the Big Schmidt Dome Compose a Celestial Bull's-eye

[illegible]

Big Schmidt Aimed Like a Cannon Captures Starlight 300 Million Years Old

[illegible]

This Blob of Gas Glows by Ultraviolet Radiation from a Cluster of Hot Stars

[illegible] S. Bowen, director of Palomar and Mount Wilson Observatories, [illegible] Institute of Technology, [illegible] photographed in the spectrum of the [illegible] radiation, [illegible] the [illegible] of the [illegible] nebula [illegible].

[illegible] swung back up for the next exposure (opposite page).

Discoveries Among Nebulæ

[illegible] are [illegible] after the plates are [illegible] with [illegible] in the laboratory [illegible].

Some of the new [illegible] are [illegible] of the earth members of our own solar system. Among them are many new comets, the wanderers of space that come in near the sun, then speed away out of [illegible] perhaps never return at all.

A very faint comet [illegible] in November, [illegible] short time for comets.

[illegible] astronomers [illegible] that we [illegible] keep track of them.

[illegible] August 3, [illegible] of [illegible] which [illegible] that it crosses the earth's orbit. [illegible] other [illegible] are [illegible] crossing that of the earth. [illegible] flying [illegible] approximately a mile or two in diameter [illegible].

When an asteroid's orbit crosses that of the

earth, it raises the question of whether a collision might be possible, but the likelihood is very small. If a collision did take place, the destructive effect would greatly exceed that of a hydrogen bomb.

Farther out in space the Schmidt photographs are picking up thousands, perhaps millions, of new stars in the Milky Way.

Still on beyond, in the distant depths of the universe, the Schmidt's "eye" is finding new nebulae, or systems of stars, many of which are great flat disks like the Milky Way. Thousands of such nebulae appear on many single Schmidt photographs.

These distant nebulae have [illegible] to [illegible] out [illegible] of light-years. In the Sky Survey [illegible] revealed many [illegible] such [illegible] of stars [illegible] in the vast [illegible] space.

Answers to Many Questions Sought

More important still, the Sky Survey is pointing the way to solving long-standing problems of the universe that have baffled astronomers for many years.

One is the exact shape and size of the Milky Way Galaxy. In exactly what part of this huge "star wheel" are the earth and sun located? Does it have curling spiral arms, like a Fourth of July pinwheel, as do many of the nebulae that we can see out in space around us?

Evolution of the stars is another puzzle. Are some of them perhaps as old as the universe itself, others short-lived? What causes the gigantic explosions of stars that we see at times both in the Milky Way and in the nebulae beyond?

The size of the universe outside the Milky Way is still another intriguing problem. Is its structure the same in all directions outward from the earth? Is it really expanding, as it seems to be, with most of the nebulae flying away from one another like the fragments of a bursting bomb? All these questions the Sky Survey will help to answer.

It is difficult for astronomers to piece together a picture of the size and shape of the Milky Way Galaxy because there is no way to get outside and look at it over-all.

The earth and sun are about two thirds of the way from the hub of the Milky Way "wheel" toward its outer rim. We see it from within, like an ant inside a hamburger trying to understand what the sandwich is like. It is perhaps 80,000 light-years in diameter and 10,000 in maximum thickness.

Inside a Celestial Sandwich

Counting the stars in various directions from us gives one clue to the shape of the galaxy. Such counts already have indicated that it is shaped roughly like a grindstone.

The largest numbers of stars lie in the directions where we see the Milky Way in our sky. This indicates the plane of our galaxy's "pinwheel." The comparatively small number of stars in other directions shows that the galaxy is of more limited extent outside this central plane. In the same way, the ant inside the hamburger might get a correct idea of its shape by counting the bits of meat in different directions from his position near the center.

On the Sky Survey photographs we can count the numbers of stars in many more parts of the sky than has been possible before, giving us a far more detailed picture of how the stars are distributed in the galaxy and therefore of its true shape and size.

Just as an explorer can get a fair picture of the nature of a mountain range by looking at its highest peaks, astronomers also can learn something of our galaxy's size and shape from the distribution of conspicuous objects in the sky, such as globular clusters of stars and planetary nebulae. The latter are spherical masses of gas surrounding very hot stars.

These objects are easily identified even from immense distances, and since they are distributed with the same symmetry as certain types of stars, they are highly useful in outlining some features of our galaxy.

Globular clusters are compact aggregations of tens of thousands of stars. Most of the clusters are massed around the Milky Way wheel's central hub, which lies in the direction of the constellation of Sagittarius.

Measuring Star Motions

Stars in the centers of planetary nebulae are the hottest known, with surface temperatures up to 180,000° F. as compared with 10,000° F. for the sun. Temperatures of stars are revealed by their colors and spectra. Diameters of the spheres of gas around these hot stars range up to 30,000 times the earth's distance from the sun (about 93,000,000 miles), so that they look disk- or ring-shaped even when remote. Early astronomers, seeing them through small telescopes, noted their

Mount Wilson and Palomar Observatories

Turbulent Clouds of Gas and Dust Obscure Vast Regions in the Sky

Loose, shapeless clouds floating in our part of the Milky Way Galaxy contain as much matter as do the stars (page 257). This view shows at right a dark nebulosity in the constellation Orion as it looked some 1,000 years ago, for the light took that long to reach Palomar from the cloud. The opaque mass shuts out distant stars and forms a backdrop for closer ones. Astronomers call the projecting darkness in center the Horsehead Nebula. The luminous patch in lower right is caused by a very hot star. Clear field at left exposes twinkling suns, the larger ones being stars of high apparent brightness.

A Celestial Wanderer Is Caught Approaching the Earth's Orbit

[illegible]

Little Schmidt Idly Scans the Daytime Horizon as Visitors Examine Its Muzzle

[illegible]

[illegible] Mount Wilson.

[illegible] the Milky Way [illegible] Survey [illegible] photographs.

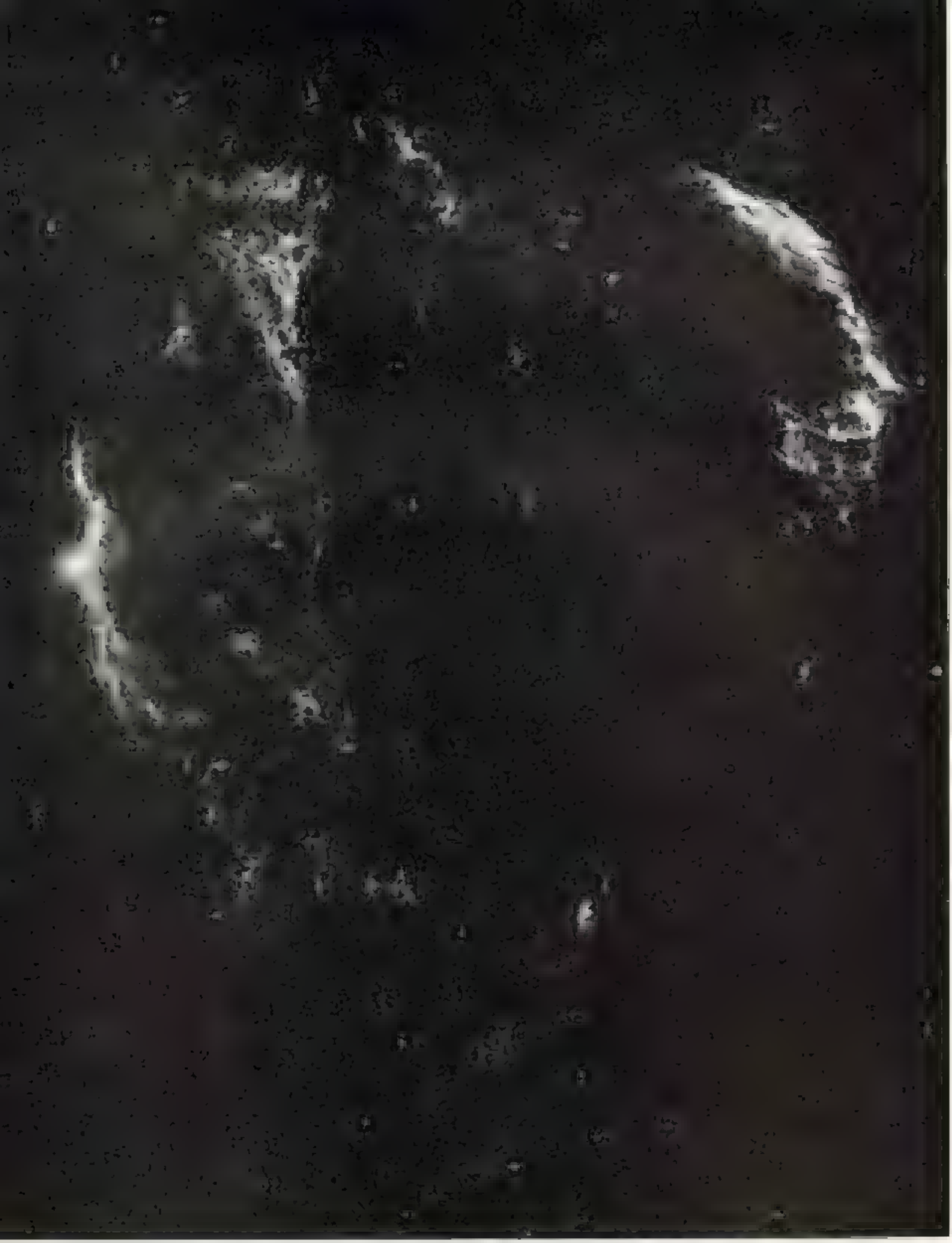
[illegible] show [illegible] from star to star [illegible] the background [illegible] Survey [illegible] would show the [illegible] which we could determine [illegible] how fast they had moved during the [illegible]

[illegible] the line of sight can be measured from the [illegible] spectrum of their light. When a star is moving away [illegible] or long wave length end [illegible] and the lines are shifted toward the red. The amount of the shift indicates the speed.

[illegible] the Doppler effect, which [illegible] is sound. One can hear it [illegible] when a [illegible] locomotive passes. The whistle [illegible] approaches, [illegible] a noticeably lower pitch as it recedes.

[illegible] of many [illegible] Survey plates [illegible]

[illegible] of stars, that the Milky Way [illegible] at different speeds at various distances [illegible] the center. [illegible]



Shattered Fragments of an Exploded Star Drift in Lacy Luminous Clouds

[illegible]

Andromeda Nebula, Milky Way's Twin, Where 4,000,000,000,000 Miles Away

[illegible]

[illegible]

Going Up! Astronomers Ride a Steam Elevator to the Top of the Dome

A missing link from the [illegible] to the dome [illegible] in the [illegible] Paranal Observatory. [illegible]

the galaxy appear to make one revolution around the hub [illegible]

[illegible] the Sky Survey will make in the study of our galaxy will be in locating and charting the extent of the great spiral arms that are believed to be flung out from its center. Photographs of many other nebulae out in space show that they have such arms.

Locating Milky Way's Spiral Arms

Outlines of our galaxy's spiral arms will be located by charting the enormous clouds of dark and luminous dust and gas that are assumed to be concentrated in them as are similar clouds in the arms of other nebulae. The photographic quality of the Big Schmidt telescope makes it especially well fitted to pick up the faint outlines of these clouds, or nebulosities, as astronomers call them.

We already know that these clouds in our galaxy are concentrated in its central plane, as the sandwiches are concentrated in the central plane of a sandwich. This, too, we see in other nebulae around us.

Scattered all through the space between the stars in the Milky Way, the Sky Survey photographs are revealing for the first time very faint luminous patches of dust and gas. Astronomers had suspected that this material was there, because it altered the light of stars shining through it from behind, but they had not been able to photograph it directly. The amount of matter between the stars in the sun's neighborhood of the galaxy probably is equal to that in the stars themselves.

An intriguing mystery of these faint patches is what makes them glow. Some luminous clouds in space shine by the reflected light of near-by stars, or by fluorescence when the gas in them is excited by the ultraviolet radiation of a very hot star, somewhat as if they were enormous neon lamps [illegible] Which, if either, of these processes [illegible] in the newly discovered patches is not yet known.

Dark Curtains Hide Vast Areas

Some of the patches of interstellar matter are dark, hiding the stars behind them. In some parts of the sky where stars are few, it is difficult to tell whether an empty spot results from an absence of stars or a dark patch blotting out the view (page 2501).

But the Sky Survey is giving us help on this problem. On some of the photographs the nebulae far out in space are scattered as thickly as the stars in the foreground. In such a region, if the number of both near-by stars and distant nebulae suddenly drops off, it is safe to assume that a dark cloud hanging in space is in the way.

The sky Survey also will help astronomers to learn more about the many different types of stars and their life histories.

In addition to small yellow stars like our sun, space is populated with giant blue and red stars, some so large that if centered on our sun they would envelop the earth in their vast interiors.

There are also pale, insignificant stars which are dwarfed by our sun, some being no larger than the earth. There are pulsating giant stars which daily swell up and contract, pairs of stars which revolve around each other, and clusters moving together.

The astronomer asks which of these suns are related, varying only because of differences in age, and which of them truly belong to separate species, so to speak.

Stars in general seem to fall into two main classes, according to studies by Dr. Walter Baade, of the Mount Wilson and Palomar Observatories staff. One class of stars, which he calls Population I, is found in the regions of dust clouds in the central plane of the Milky Way, in the "meat" of the sandwich. The other class, Population II, is concentrated heavily in the hub or nucleus of the galaxy's wheel and spreads out in a somewhat spherical formation around the flat sides of the wheel. These stars also make up the bright globular clusters.

Are Stars Still Being Born?

The Population II stars are thought to be old, stable suns, perhaps as ancient as the galaxy itself.

Stars of Population I, on the other hand, are believed to be comparatively young. Some of the brightest stars known, the blue giants, belong to this group. They expend their energy so fast that they cannot live long—only a few million years. If they were as old as the stars of Population II, they would have burned themselves out long since.

For this reason astronomers suspect that such stars are in a continuous process of birth and death. As old ones burn out and die, perhaps others are being created. They may be born from contracting clouds of matter in interstellar space, as has been suggested by Drs. Bart J. Bok and Fred L. Whipple of the Harvard Observatory and Dr. Lyman Spitzer, Jr., of Princeton Observatory.

One theory is that the particles forming the interstellar clouds are pushed together at first by the pressure of light from near-by stars. After the clouds reach a certain density, gravitational attraction pulls the dust particles still closer together. With this increase in density comes a rise in temperature. Eventually the contracting cloud becomes self luminous and then can be called a star.

In some regions where there are heavy concentrations of dust in space, Dr. Bok has found small nebulous globules of matter which he thinks may be stars in the process of being born in this way. On the Survey photographs more "embryo stars" may be located, and from them astronomers can check these ideas of stellar evolution.

Flaring Stars Pose a Puzzle

Why some stars explode, suddenly flaring up to 150,000 times their former brightness, is another puzzle that the Sky Survey may help to solve. Exploding stars are called novae, or "new," because early astronomers, seeing them shining forth where no star had been seen before, believed they were new stars.

The Sky Survey photographs, taken in both red and blue light, will give us for the first time a record of the temperature, color, and brightness of vast numbers of stars as they are today. Later when one of these stars flares up as a nova, astronomers can refer to Survey plates to check its condition before the explosion. This may furnish clues to the cause of the outburst and indicate what types of stars are most likely to explode.

It would be of considerable interest, for example, to know whether our own sun is a star of the type that may explode sometime!

Another kind of exploding star is called a supernova. Whereas ordinary novae at their peaks radiate energy at a rate some 100,000 times as great as that of the sun, the supernovae may radiate at rates hundreds of millions of times as great (page 254).

There are definite records of only three supernovae in our galaxy, while there may be as many as three or four ordinary novae found in it every year.

Supernovae can also be detected in the outer nebulae. Comparing pictures of the nebulae taken during the Sky Survey with other pictures of the same ones made later will reveal when supernovae flare up.

It is important to find these stars while they are exploding, since the number studied in detail so far has been too few to provide a clue to why they explode.

Universe Seems to Be Expanding

Already the Sky Survey also is helping to clarify the fascinating question of whether the universe is expanding, with all the distant nebulae flying away from one another at inconceivable speeds.

Dr. V. M. Slipher of Lowell Observatory, Flagstaff, Arizona, and Dr. Edwin P. Hubble and Dr. Milton L. Humason of Mount Wilson first studied the indications of this expansion. The clue was the same Doppler effect (page 254) used in measuring the speed with which stars are moving toward or away from us in the line of sight.

In the spectra of the distant nebulae the lines almost always were shifted toward the red, or long-wave, end, strong evidence that these nebulae were receding.

More startling still, the farther away a nebula was, the more its spectrum lines were shifted toward the red. This meant that the more distant the nebula, the faster it was apparently speeding away. If this was true, it indicated that the universe was exploding and that the explosion had been going on for millions of years.

But the nebulae that Hubble and Humason studied were only a few and widely separated. To make sure that the "red shift" meant what it seemed to mean, they needed to know whether this was happening to nebulae in all directions and at greater distances.

Now the Sky Survey photographs are locating thousands of distant nebulae. The spectra of their light will be photographed with the 200-inch telescope. These studies will reveal whether nebulae in all parts of the universe are apparently speeding away and whether their speed, too, is in proportion to their distance.

Calculating Distances of Nebulae

The distances of nebulae from the earth can be measured accurately only if they are members of a cluster of nebulae. This is because the distance of a nebula can be judged only from its brightness. Two nebulae may appear to be of the same brightness, yet actually one of them may be a faint body that is nearby, and the other a bright one far away. But if all the nebulae in a cluster are bright, it is safe to assume they are near by; and if all are faint, they must be very distant.

Only about three dozen clusters of nebulae, scattered in different parts of the sky, were known before the Sky Survey began.

Now, with the Survey only about half finished, nearly 1,000 clusters of nebulae have been found on its photographs. They are well distributed all over the heavens.

Already Dr. Humason has studied the spectra of the light from nebulae in some of these newly discovered distant clusters, 250 to 350 million light-years from the earth. The red shift in them indicates the nebulae are racing away at 38,000 miles per second, more than one-fifth the velocity of light!

It may be, of course, that the red shift does not really mean that the nebulae are rushing away, but that it is the result of some undiscovered law of Nature.

Whatever the cause, the Sky Survey will help reveal whether the rule applies all through

[illegible]

Goal of the Sky Survey: New Light on the Universe

[illegible]

the universe [illegible] in certain patterns.

Meanwhile, the Sky Survey [illegible] of large numbers of [illegible] relatively [illegible] is [illegible] a new field to [illegible] distribution and structure of the [illegible] universe.

[illegible] have been found that [illegible] as [illegible] or even a [illegible] Here we [illegible] Nature [illegible] to form the nebulae, the nebulae [illegible] assembling into clusters and these gathering into still greater groups.

[illegible] all this, the Sky Survey is adding to our knowledge of the size and structure of the universe by revealing the number and [illegible] of [illegible] clusters of nebulae [illegible] directions. [illegible] the numbers of stars visible in various directions [illegible] shape and structure of our own Milky Way Galaxy, [illegible] the nebulae [illegible] will give [illegible] a more complete picture of the universe as a whole. It may help to reveal how large the universe is, whether it is finite, with definite boundaries, or whether it extends out farther than we can ever explore.

These are the principal problems for which the Survey will supply new data. But [illegible]

Palomar's Night Shift Relaxes with Go, an Intricate Japanese Game

[illegible]

[illegible] astronomy [illegible] and [illegible]

[illegible]

[illegible] search for knowledge has led us upward [illegible] the cave.

Astronomy and Human Progress

[illegible] astronomers [illegible] from the immediate practical [illegible] study [illegible] and [illegible]

[illegible] of Kepler, Galileo, Newton [illegible] laws of planetary motion led to the foundation of the science of the heavens. The knowledge of mechanics [illegible] which [illegible]

[illegible] these problems [illegible] the fundamental discoveries [illegible] been made.

It may be that the [illegible] heavens will supply us clues to [illegible] our conflict with Nature. [illegible]

[illegible]

Clove-scented Zanzibar

On a Lush African Island an *Arabian Nights* City Thrives on Spice and Copra

By W. Robert Moore

With Illustrations from Photographs by the Author

"Attention, please! One, two, three, four, testing," the plane dispatcher at the Dar es Salaam airport in Tanganyika announced: "Passengers to Zanzibar, Tanga, and Mombasa, please board the aircraft."

Historic Zanzibar, I thought, rated at least a lift in the voice!

Within minutes after our take-off I eagerly watched that green island swell from the sea haze and take shape. Soon a sapphire-and-jade fringe of coral reefs, then feathery coconut palms and clove plantations spread close beneath us.

Swinging in a wide arc before sliding to the airstrip, we sped over closely packed Zanzibar town, dazzling white on a jutting triangle of coast (page 274).

History of Zanzibar "Written by Winds"

Out in the blue waters of the roadstead clustered a fleet of Arab dhows. Zanzibar's history has been "written by the winds" that bel v the lateen sails of such craft from the coasts between the Red Sea and India.

As far back as A. D. 60, when a Greek merchant living in Egypt wrote the first known sailing directions to the Indian Ocean, the *Periplus of the Erythrean Sea*, sailors already were riding the monsoon to Zanzibar.

They came, says the *Periplus*, bringing lances, hatchets, daggers, awls, glass; also "a little wine and wheat, not for trade, but to serve for getting the good will of the savages." They took back ivory, rhinoceros horn, tortoise shell, and coconut oil.

Today high-prowed Arab dhows still come to Zanzibar. Like migratory birds, they sail down on the northeast monsoon with cargoes of dates, incense, dried shark, Persian carpets, and brassware. Waiting until the winds change, they return home with mangrove poles, tea, coffee, sugar, and maize.*

In market places, at Arab coffee shops, and down by the water front, I met many of the new members of these dhows: sun-tanned, unshuttered men clad in long-skirted gowns, turbans, and sandals. Hilts and ornamented silver sheaths of curved J-shaped daggers protruded from their waist sashes (page 262). No concealed weapons here.

Most of the crews have shipped from Arabian shores—from Muscat (Masqat) and Sur on the coast of Oman. Among them were lean, fiery-eyed men from the sun-scorched Hadhramaut.†

Sultanate under British Protection

Zanzibar Island lies only 25 miles off the East African coast (map, page 264). In olden days the island was ideal as a trading center. Near the mainland, it still was far enough away to afford security from warlike tribes. It had a plentiful water supply and a safe harbor.

The island attracted Arabs, Persians, and Indians (some say even the Chinese). Portuguese, following Vasco da Gama, had trading posts here from the early 1500's until they were ousted by Arabs nearly two centuries later. In 1840 Seyyid Said, Sultan of Oman, moved his capital here from Muscat.

Late in the last century, when European powers began to take feverish interest in Africa, they sliced away virtually all of Zanzibar's mainland possessions. To stabilize his interests, the Sultan in 1890 arranged for a British protectorate.

Today the sultanate is limited to Zanzibar, Pemba, and the tiny islands that surround them. The red flag of the Sultan also flies over old Fort Jesus in Mombasa, but that, with the 10-mile-wide strip of Kenya coastline which is included in the protectorate area, is leased to the Government of Kenya.‡ The ports of Mombasa and Dar es Salaam have captured much of the growing commerce of East Africa.

Old Araby—with Telephones

Although Zanzibar has lost some of the trade prestige it once enjoyed, it seems unconcerned over the loss. Prosperous in its own quiet way, it has time for friendliness and courtesy as Old World charm.

Here is one spot where you can pick up a telephone—if you must use one—and ask "Central" for your party by name!

The town and its people seem to have been

* See "Sailing with Sindbad's Sons," by Alan Villiers, NATIONAL GEOGRAPHIC MAGAZINE, November, 1938.

† See "[illegible] to the Hadhramaut," by [illegible], NATIONAL GEOGRAPHIC MAGAZINE, October, [illegible].

‡ See "Britain Tackles the East African Rush," by W. Robert Moore, NATIONAL GEOGRAPHIC MAGAZINE, March, 1950.

Turkish Silversmith Polishes the Sheath of a Jeshapee Dagger

[illegible]

[illegible] matched from some [illegible] Wahabi [illegible] Wahabi [illegible] Arab [illegible] or Gaza [illegible] mosques and [illegible] Mosques are small and [illegible] in accordance with the [illegible] Arabian [illegible]

[illegible] When Washington, D. C., was [illegible] Here was [illegible] village [illegible] site. Most of the [illegible] was built after Sultan Said [illegible] years ago.

[illegible] Most [illegible] citizens still [illegible] Arab [illegible] that when a person [illegible] place the [illegible] in his own property.

At the [illegible] visit Zanzibar's only [illegible] was still unfinished. The [illegible] people of [illegible] Arab [illegible] with [illegible] Zanzibar [illegible] Installation of [illegible] was [illegible]

[illegible] the [illegible] that [illegible]

[illegible] Sunday Also [illegible] first time [illegible] are clipped [illegible] passing [illegible] page 277:

[illegible] their [illegible] is largely [illegible] on [illegible] roads. While [illegible] Texas [illegible] the [illegible] [illegible]

No Room to Get Lost

[illegible] "[illegible]?" I asked a British [illegible] who [illegible] me [illegible]

[illegible] "[illegible] place you want to go," he [illegible] with a smile.

So I started walking.

[illegible] white [illegible] with dazzling [illegible] and deep shadow I found old, [illegible] Arab [illegible] large heavy [illegible] frames, [illegible] were [illegible] decorated with patterns of lotus, arabesques, [illegible] and date trees [illegible] from the Koran.

[illegible] [illegible] Wahabi [illegible] [illegible] page 276)

A Water-front Gang Twists Coconut Fiber into Hawsers for Dhows

[illegible]

[illegible] seem to have been [illegible] [illegible] [illegible] around it.

Some of the doors [illegible] from India; others were carved locally. [illegible] woodworking [illegible] I saw [illegible] [illegible] that would add [illegible] to [illegible] and [illegible] water [illegible].

[illegible], [illegible] Arab [illegible], Persian [illegible]. The [illegible] are not Arabic, but come from [illegible] and are highly prized.

Sight-seers Walk at Their Own Risk

Threading these narrow streets, I literally rubbed elbows with a [illegible] medley of peoples. I [illegible] of [illegible] in front of a [illegible], [illegible] at the same time to keep [illegible] with [illegible] or [illegible].

[illegible] are [illegible]. [illegible] a warning so that pedestrians can [illegible] themselves against walls or step into doorways.

[illegible] the [illegible], carrying big [illegible]. In the [illegible] to [illegible] their [illegible].

Here are peoples from Arabia, the Persian Gulf, [illegible]. Most striking are the [illegible] Arabs [illegible] and [illegible] of white [illegible]. [illegible] Africans.

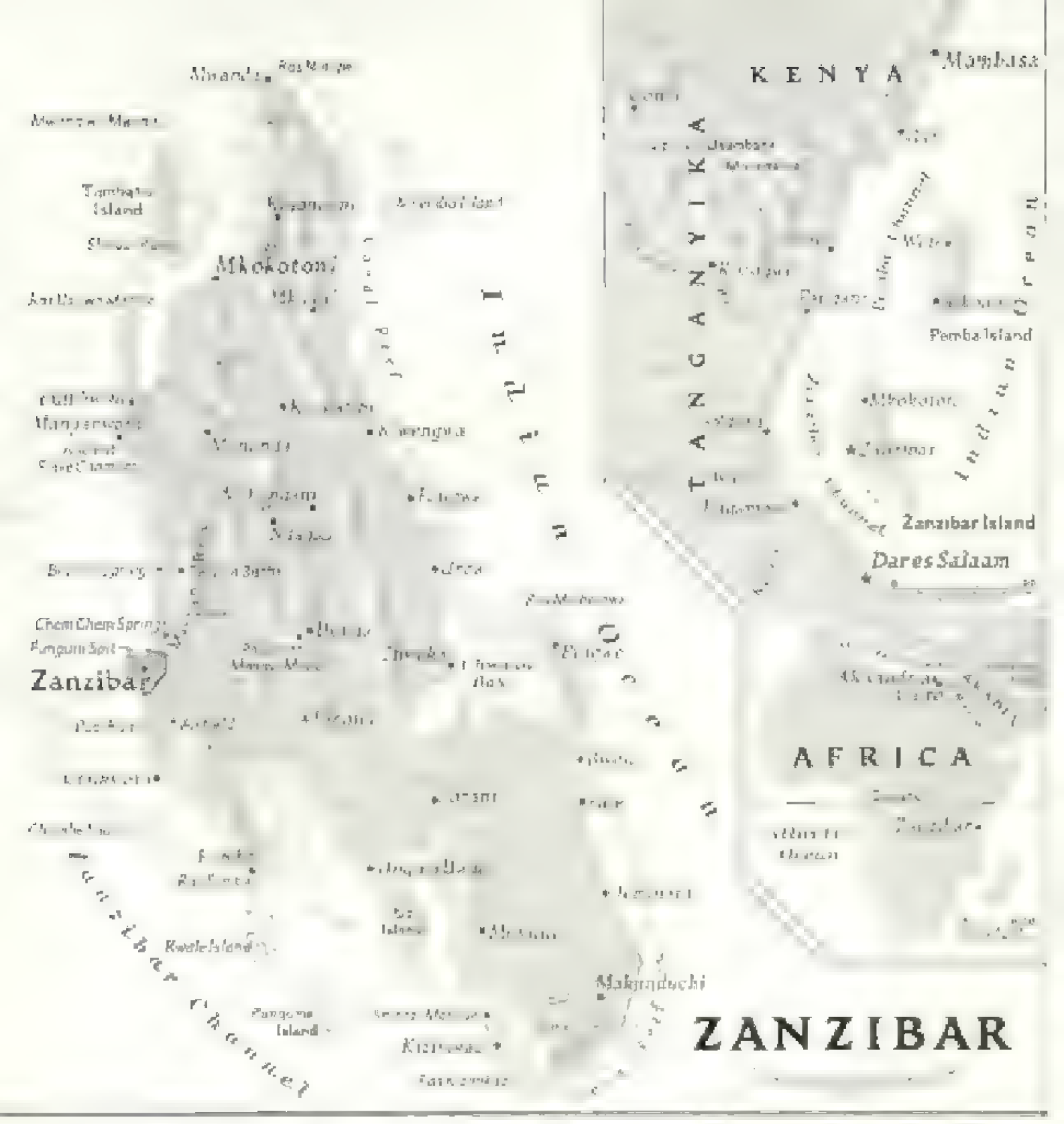
Most of the [illegible] are [illegible]. [illegible], and [illegible]. [illegible] gold [illegible].

Moslem [illegible] women [illegible]. [illegible] from a [illegible]. [illegible] also Moslem, [illegible].

In [illegible] their [illegible], [illegible] which [illegible], [illegible] women are as [illegible] as Western women. [illegible] of pattern and [illegible].

The [illegible] in Zanzibar [illegible] call to mind the [illegible] of Hawaii. Some are immediate [illegible] to the merchant who has heavily [illegible] pattern that doesn't click.

[illegible] women in [illegible] accents to Zanzibar. [illegible] in [illegible]



Zanzibar and Pemba Lies in the West Indian Ocean, Spice Out Cloves and Great Cakes

Under an Arab sultan and British protection these islands grow four-fifths of the world's clove crop. Here Dr. David Livingstone stood out his expeditions to mainland Africa, 25 miles to the west

afternoons, when families flock to the waterfront park near the Sultan's palace to take their airing, the place bursts into full bloom.

A Visit with the Sultan

Almost every day, at this sundown hour, red-fezzed guards at the palace snap to salute, and a red limousine carrying the Sultan and Sultana on their afternoon drive rolls out of the gateway. There are no screaming sirens in its vanguard.

The present Sultan, His Highness Seyyid [illegible] Ibn Harub, came to the throne [illegible]. He is 73 years old (opposite).

[illegible]

Some a dozen men, most of them bearded and elderly, were gathered in the waiting room when I arrived. They were dressed in formal Zanzibar Arab attire (page 267).

When I walked into the modest, red-draped throne room, the Sultan greeted me pleasantly: "Good morning, how are you?" His English was precise; his manner warmly cordial.

He wore neither dagger nor sword. Otherwise his costume was the same as those of

Zanzibar's Wise and Kindly Sultan for 40 Years: Sayyid Khalifa bin Harub

Electric Bulbs Above the Palace Outline the Sultan's Crest; Veiled Women on the Balcony Celebrate His Birthday

A Men Do the Selling and Most Buying in Zanzibar's Market

[illegible]

Glorious Donkey Has a Henna Rinse

[illegible]

Black, Bitter Coffee

[illegible]

▲ **When Zanzibar Tide Goes Out, Fishing Boats Tilt Drunkenly on Their Sides**

Fashion Sometimes Loves White Robes Like Nightgowns for Comfort in the Tropics

his subjects outside, except that his turban was folded into a peak in front. Years have silvered his beard.

We chatted about Zanzibar and my visit to East Africa while he graciously posed for pictures, first alone and then with Prince Abdalla, his only son. When I was finished, a sweet drink was served. Within those few minutes I felt the warm kindness that has endeared the Sultan to his subjects.

Far more imposing than the Sultan's Saracenic white palace (pages 266, 274) is the adjacent Bet el Ajaib, "House of Wonders." When it was built in 1883 by Sultan Barghash, no one in the city had seen anything so big.

Surrounded by pillared verandas and surmounted by a clock tower, the building was erected for ceremonial purposes, though two succeeding sultans used it as a residence. Its heavily carved, brass-spiked outer doors and inner ones bearing texts from the Koran show particularly fine workmanship. It now houses government offices.

Women Have Captured an Arab Fort

Confusing to the newcomer is the time recorded on the House of Wonders' clock. At noon the hands stand at six; they reach twelve at sunset when, by the old Arab method of reckoning, the new day begins.

Beside the Bet el Ajaib stand the weathered walls and towers of an old Arab fort. Its walls now echo to feminine chatter rather than clatter of arms, for recently the keep was restored as a club for the women of Zanzibar, many of whom are in purdah. Gardens inside have been laid out for tennis, badminton, and basketball.

When Sultan Seyyid Said set his capital in Zanzibar more than a century ago, Arab influence penetrated far into Africa.

"When you play on the flute at Zanzibar," ran an Arab proverb of the time, "all Africa as far as the Lakes dances."

Trembled, too. For those were days when "black ivory" was a marketable commodity. Slavers roamed the interior and captured any native they could.

Kidnaped blacks were listed in the open market in Zanzibar along with bullocks, goats, and fowls. It is a grim commentary on the value set on human life that an adult slave brought only half the price of an Arabian donkey.

On the brighter side of Zanzibar's ledger, however, is the clove industry that Seyyid Said introduced to the island. From the gardens he started, Zanzibar and the near-by island of Pemba still produce some four-fifths of the world's supply of that fragrant spice.*

For me the city's crowded, busy harbor conjured up pictures of high adventure aboard ancient argosies—also memories of Christmas dinners and boyhood toothaches, for here hung the pungent odor of cloves. Happily it even overpowered the reek of copra stacked in sheds awaiting shipment.

One of the World's Spiciest Harbors

Cloves are Zanzibar's life, its sustenance. In the dock area I watched barebacked men, their bodies glistening, trundle carts piled high with bags of spice. In auction rooms more bags were tiered for inspection and sale.

In warehouses I saw men working over big piles, bagging the cloves into specially made matting sacks for shipment abroad.

Hard by, a clove-oil distillery cast more odors into the air. From stems and inferior cloves is steamed the volatile oil used in pharmaceutical preparations and perfumes and converted into vanillin.

With the manager of the Clove Growers Association I went into the country to see the plantations. We were too early for the busy picking season. But the buds on the clove trees (*Eugenia caryophyllata*) had swelled nearly to full size (page 271).

In the so-called "flushing" season the nail-like calyxes of the buds turn pink and then are ready for picking. They must be harvested before the buds burst into bloom.

When cloves are ready for gathering, gay and [illegible] men, women, and children pitch in for the picking. Women and children pluck the bunches of buds from the lower branches; men climb ladders or scramble up into the tree branches and draw the clusters within reach with hooked sticks. Since the trees grow to heights of 30 to 50 feet, harvesting is not easy.

The clusters are plucked stems and all. After the day's picking is done, the stems are separated from the buds. There's a knack to it. Squatting workers pick up the bunches [illegible] and crush them against the other; buds fall into one heap and stems are tossed into another. The cloves are then dried on open concrete platforms.

"Sudden Death" in Clove Plantations

In Zanzibar I soon learned about "sudden death." It is not the quick thrust of a dagger in a darkened lane or the violence that old Zanzibar once knew, but a disease destroying many clove trees. One day a tree may appear healthy, and the next day its leaves suddenly wilt and the tree is dead.

Nearly half of Zanzibar's clove trees have been killed, and the disease is advancing on Pemba. Regeneration of trees may redeem

* See "Spices, the Essence of Geography," by Stuart E. Jones, NATIONAL GEOGRAPHIC MAGAZINE, March, 1949.

Zanzibar Harbour: a Bit of Arabia off Mid-Africa

[illegible]

Children of Zanzibar Merchants: Their Faces Spell "India"

A Fez-capped Servant Shines a Carved Door's Brass Hinges

some plantations, but there is little assurance that they, too, may not prematurely die.

Special research has been set up to study "sudden death." When I talked with the scientists, they believed the death due to a virus carried by scale insects, which in turn are carried and coddled as milk-producing "cows" by armies of ants.

To combat the disease, the Government now plans to cut down 60,000 infected trees and spray the area with insecticide.

Despite the ravages of the disease, there are still some 4,000,000 clove trees on the two islands, and the season's crop averages some 9,000 tons of dried cloves.

The building in which some of the research is being done is the house where Dr. David Livingstone stayed in 1866 when he was fitting out his last famous expedition into Africa's heart. It stands on the shore at the northern edge of the city.

Church Built in Former Slave Mart

Even more vivid reminders of this great missionary-explorer are the Universities Mission and the Anglican Cathedral, both on the site of the city's old slave market.

Livingstone not only inspired the founding of the Universities Mission to Central Africa, but he did more than any one other man to awaken the world to the unsavory traffic in humans. Thanks to that awakening, slave trading ended, and the altar of the church now stands over the spot once occupied by the auction block.

Livingstone's description of the Zanzibar of his day was pungent. Shocked at its filth, he exclaimed that it should have been named "Stinkibar."

At that time a fetid creek ran through mud flats back of the town, and the area was a popular place for casting refuse and even human corpses. A canalized section of the creek is still there, but much of it has been filled in and converted into spacious recreation grounds and gardens.

Rain trees, wide-branched and red-blossomed, arch the adjacent street; near by are Victoria Gardens and the imposing Sultan's British Residency.

Crossing the bridge over the creek from Stone Town, I entered Ngambo—the "Other Side." This Other Side is a 1,000-acre confusion of twisting streets, tortuous alleys, small shops, and mud huts where dwell 30,000 persons, mostly Africans, who make up more than half the population of Zanzibar town.

Of late much work has been done to clear portions of the area and replace dingy thatch-roofed huts with model housing. A fine civic center, the Raha Leo ("Rest Today"), consisting of a movie theater and dance hall, reading rooms, broadcasting studio, a clinic, and playground for children, was opened in 1948. So this Other Side is gaining a much brighter side.

Tropical Gardens and Sterile Coral

From Zanzibar town roads thread the island. Asphalted highways extend nearly the full length of the 55-mile-long island and cross its waist to the east-coast village of Chwaka. Another shorter road probes the small peninsula south from the capital to Ras Fumba, on whose shores can be found the *Murex* shell, from which ancient Tyrians extracted their famous purple dye.

Exploring these country roads, I found surprising contrasts between the two sides of the island. Lush tropical gardens, frond-canopied coconut groves, and glossy-green clove trees luxuriate on the fertile low hills of the western portion of Zanzibar.

In crossing to the eastern side and in journeying south, I passed through rough bush and open spaces of sterile coral outcrop. Here is the Wanda country, home of leopards, wild pigs, and small gazelles.

Only a few miles north of the capital are two springs, Chem-Chem and Mnemnopotia Bububu, which in early days made Zanzibar famous as a good watering place for ships. Now they furnish the city's water supply.

Ruins of old palaces strew the west coast and smother in its vegetation. Sultans seem to have delighted in building palaces, creating pleasant gardens, and erecting elaborate Persian baths for harem favorites.

Old cities likewise have been almost obliterated. Crumbling walls and remnants of mosques are about all that remain of cities that once flourished on small Tumbatu island, at Unguja Ukuu, and at Kizimkazi.

At Kizimkazi, however, I found a mosque still in use after 830 years! An ancient Kufic inscription beside its ornate *mihrab* (which corresponds to the altar of a Christian church) records the date of its building.

A remnant of an old wall still marks a part of this ancient settlement. It is believed to have been built by the early Shirazis, or settlers from the Persian Gulf.

Coconut Pickers Frog-hop Up Trees

Roaming the country, I came upon a gang of men picking coconuts. Plantation owners are often pictured loiling in the shade, waiting for the coconuts to fall. But it isn't that simple. When the nuts are ripe, men climb the high swaying trees and slash off the clusters with knives.

In Pacific islands I have watched nimble-toed natives "walk" up the trees, using

Zamalek's Congested Business Section Calls This Narrow Lane Its Main Street

[illegible]

notches for toeholds.* Here the climbers slip a short loop of fiber rope about their feet to give them a better grip. Then, climbing with their hands and making froglike hops, they quickly scale the palms.

So tally men can count the number of trees a man climbs, each worker has his own singing call. When a picker completes a tree he sings out and slides down. How the tally men ever kept check I cannot say, for there seemed to be a constant treetop chorus of chanted calls!

After the nut clusters have been cut down, bearers carry them on their heads or on donkeys to the huskers and cutters.

Stripped of outer husks by a few swift jabs on a pointed stake set in the ground, the nuts are split and spread in the sun to dry. Later the meat is removed.

Many of the nuts nowadays are kiln-dried. The curing of the oily meat—the copra of commerce—is better controlled in that way, particularly in rainy weather.

The Universal Palm

Next to cloves, copra is Zanzibar's most important export crop. But here, as in many other lands, the coconut tree is valuable for far more than its copra.

Its leaves are used for thatching and for baskets and mats. Sap from the buds is fermented into toddy; the nuts furnish both food and oil. The husks serve as fuel and as fiber for rope.

In Makundachi, at the island's southern end, the Wahadimu villagers, one of three tribes native to Zanzibar, have developed a sizable home industry making coir rope.

Coconut husks are buried in beach sand below high-water mark and left for three months to disintegrate. The fibers are then gathered, washed, and dried.

Women wind the fibers into strands by rolling them against their legs. Then, turning the separate strands deftly between the palms of their hands, they twist them into small ropes about the thickness of a lead pencil (page 271).

Some of the rope is made into foot loops used by coconut pickers, and much of it goes into hawsers for Arab dhows. On Fungani Spit in Zanzibar Harbor is a ropewalk where workmen do a thriving business twisting these large ropes, especially during the season when the dhows are anchored offshore (page 263).

Search for a Henna-dyed Donkey

"Have you seen any henna-dyed donkeys yet?" asked a friend one day. "There's a color picture for you."

I didn't. So we had plans for me to meet a man who owned one. My friend had even seen him riding it along the north road toward Mkokotoni.

While waiting, I learned that the custom of tinting donkeys with henna had once been fairly popular on Zanzibar—nobody knew just why—but was now dying out.

Through quick word channels that constantly amazed me in Zanzibar an old Arab soon presented himself and offered to take me to the man with the henna-dyed donkey.

Motoring up the north road, we came to an estate owned by a bearded patriarch, Sheik Aziz Bin Amor. He received us graciously and agreed to pose up the beautiful steed. The donkey was brought; it was dyed with a henna wash (page 269).

The Sheik's willingness to pose was only one of his kindly gestures. He invited us to tea, apologizing for its humbleness.

We had excellent tea, quantities of cakes, corn biscuits, and bitter Arab coffee. Then servants brought plates heaped with a delicious sticky sweet, followed by coconuts. We drank the water straight from the shell.

I bore up my end in eating until my host urged us to taste some fruit the boys had just picked. By then my belt was in no condition to be further strained.

When we bade the Sheik goodbye, he asked that I return and share a humble meal with him—not just a tea!

Natives Dance to Pulsating Drums

On my last evening in Zanzibar, the Mayor, youthful Sheik Soud Ahmed, called to ask if I would like to go to the gardens of the Civic Center to see a native dance. The celebration was well under way when we arrived.

On big drums, little drums, and rattling baskets of seeds, like the gourd rattles of Latin America, an orchestra beat out pulsating African rhythms. Cadences started slowly, then quickened into wild, stirring finales.

Women wore feathered headdresses and heavy bands of beads; their faces were painted white. They jogged, writhed, and gesticulated to the thumping drums and gay African song. Some swished wildebeest-tail switches; others carried canes. Bells jangled at their ankles.

Spears planted upright beside circling dancers symbolized the presence of the spirits and jinn. These invisible guests, the people say, must enter the performers' bodies to spur them to dance.

Judging from the enthusiasm and endurance of the dancers, I am sure that all the jinn in Zanzibar were present and doing their utmost!

* See "Tuche Wards of Uncle Sam," by W. Robert Moore, [illegible]

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In Mexico The Society and the Smithsonian Institution, January 16, 1939, discovered the oldest work of man in the Americas for which we have a date. This slab of stone is engraved in Maya characters with a date which became [illegible] A.D. [illegible] It antedates by 200 years [illegible] in America, and [illegible] great center of early American culture, previously unknown.

In November 11, 1935, in a flight sponsored jointly by the National Geographic Society and the U. S. Army Air Corps, [illegible] of 7,620 feet. Capt. Albert W. Stevens and Capt. Orvil A. Anderson [illegible] of science for instruments, and showed people of [illegible]

A notable undertaking in the history of astronomy was launched in 1939 by The Society in cooperation with the Palomar Observatory of the California Institute of Technology. This project will require four years to photograph the vast reaches of space and will provide the key which astronomers [illegible] the world.

In 1938 The Society sent out seven expeditions to study the eclipse of the sun, a range [illegible] from Burma to the Aleutians. The fruitful results helped [illegible] geodetic surveys of North America and Asia.

The Society granted $37,000, and in addition $15,000 was [illegible] A people [illegible] of the giant sequoia trees in the Giant Forest of Sequoia National Park of California.

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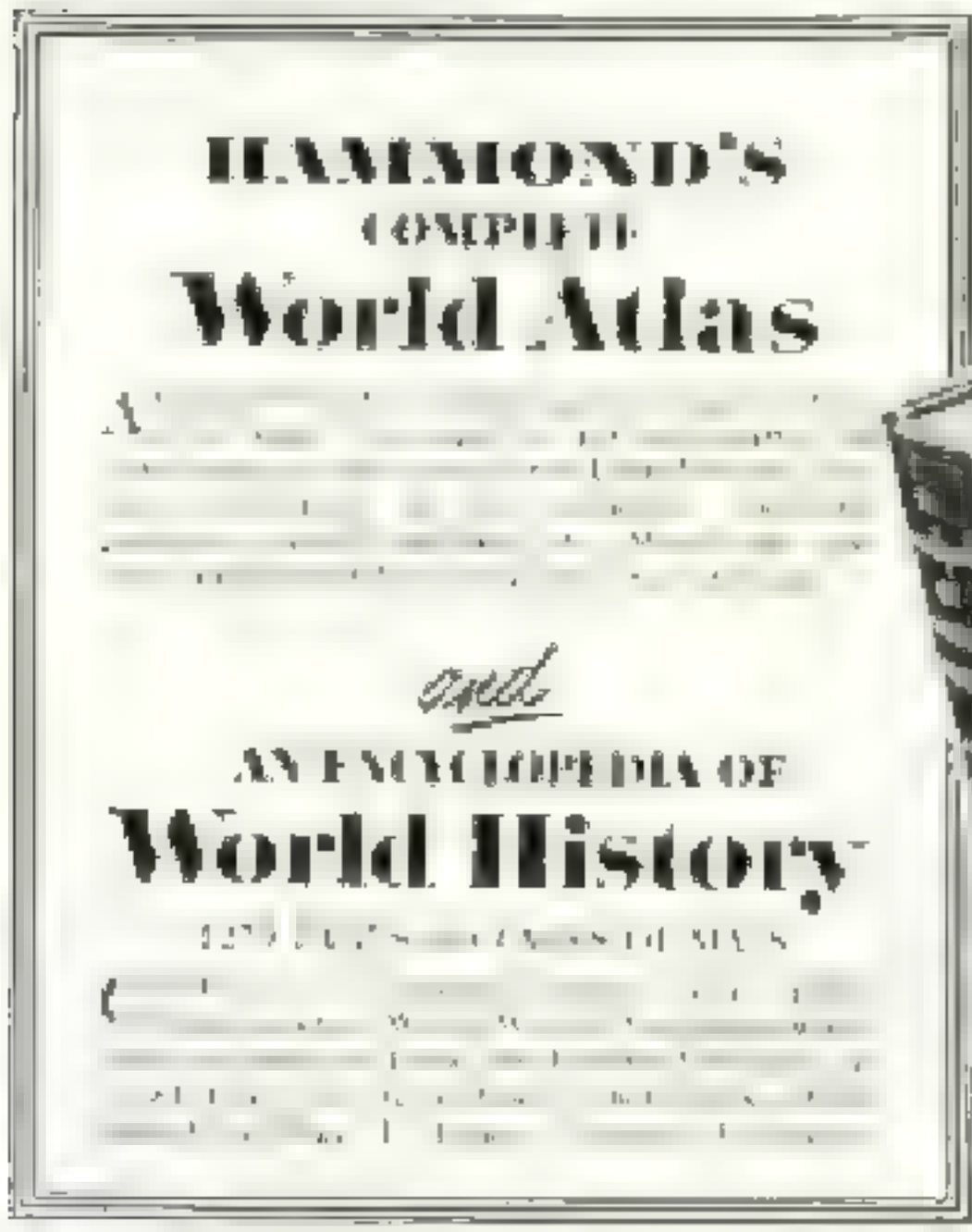

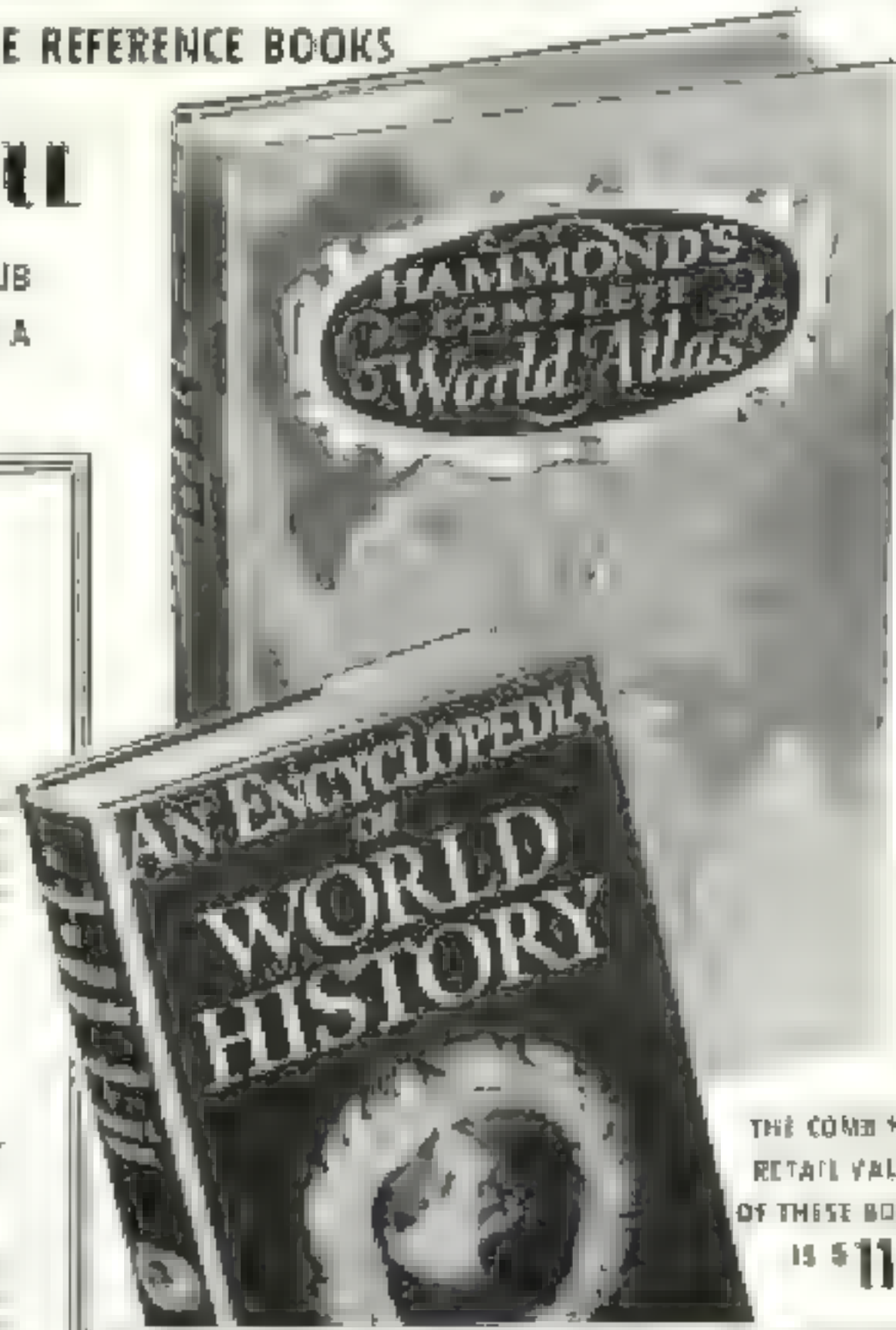

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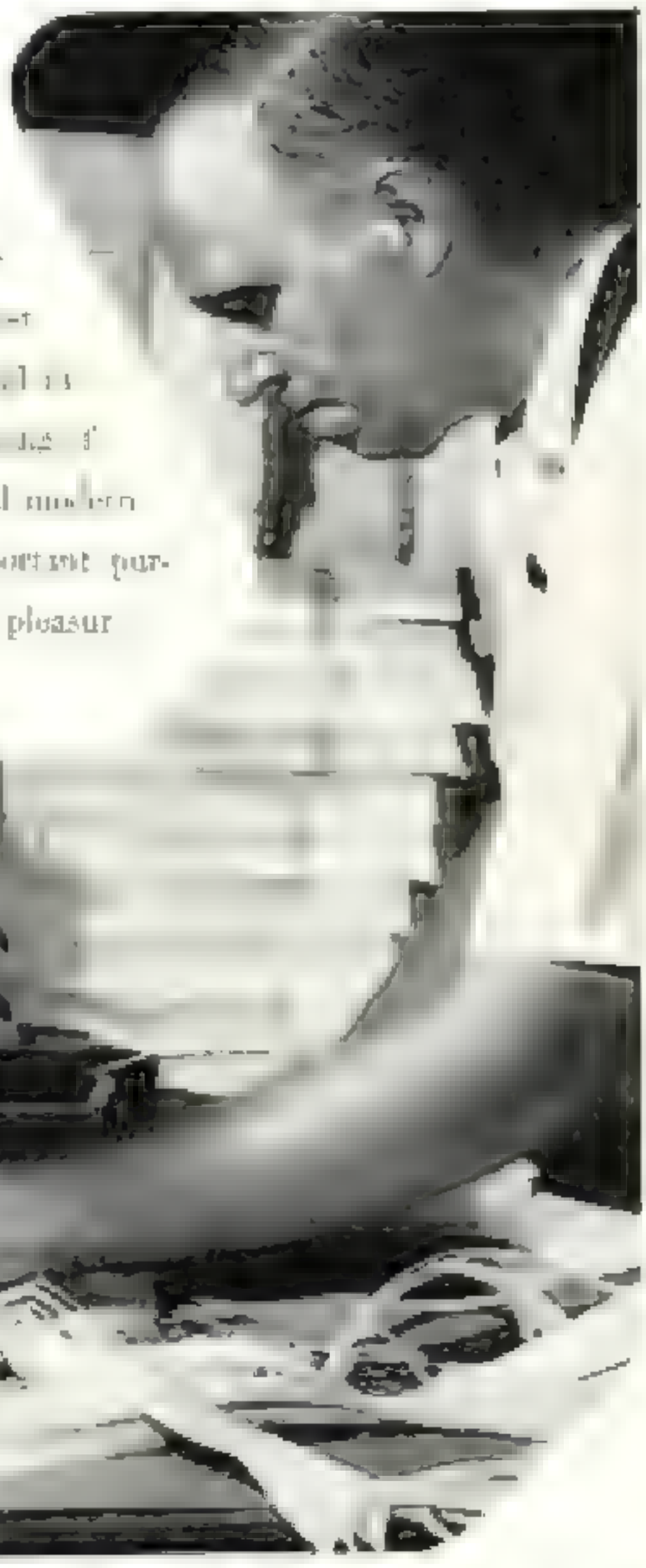

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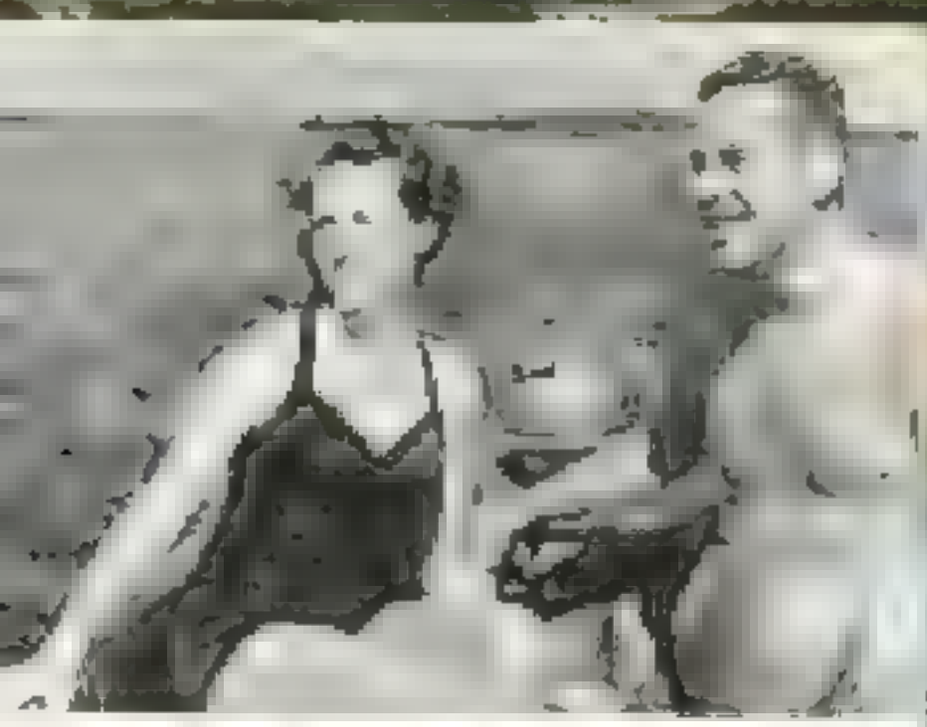

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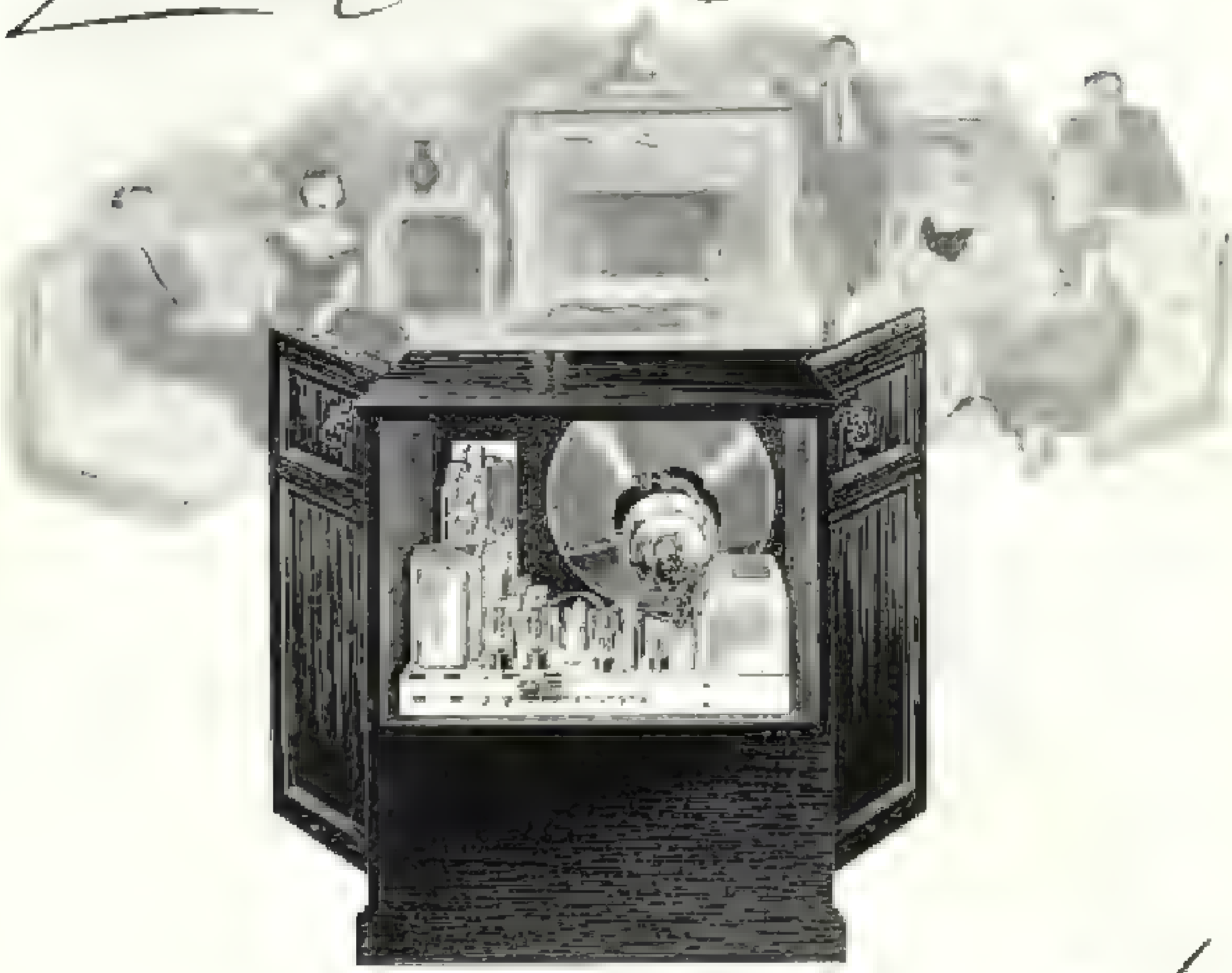

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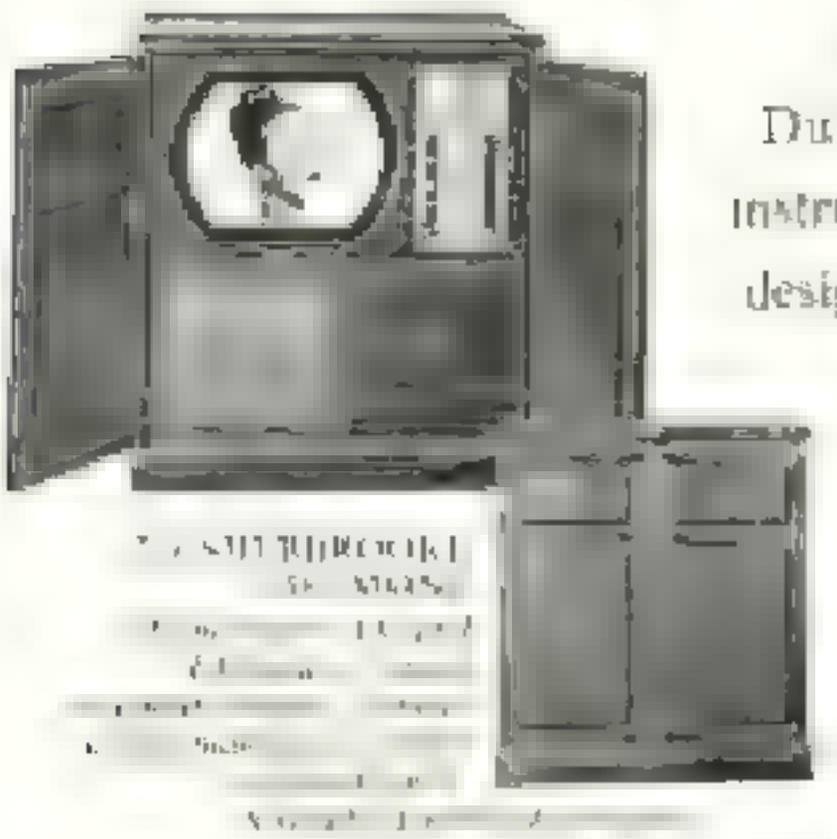

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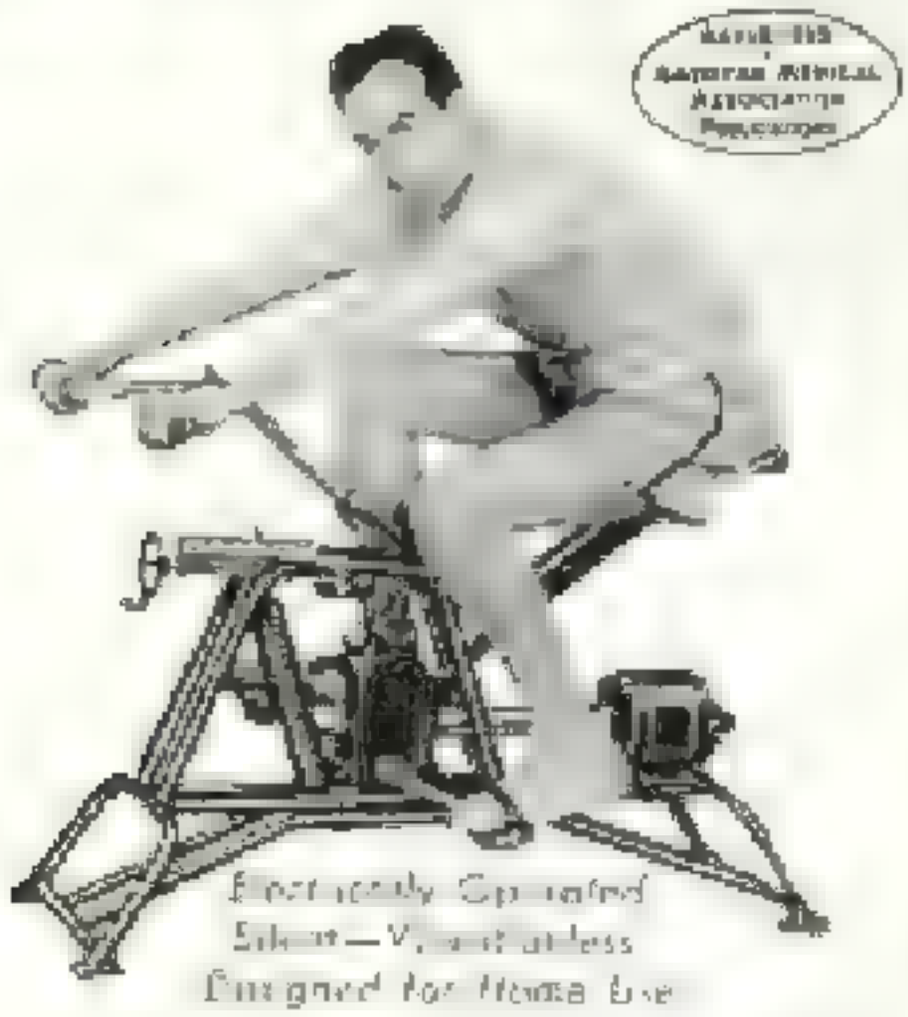

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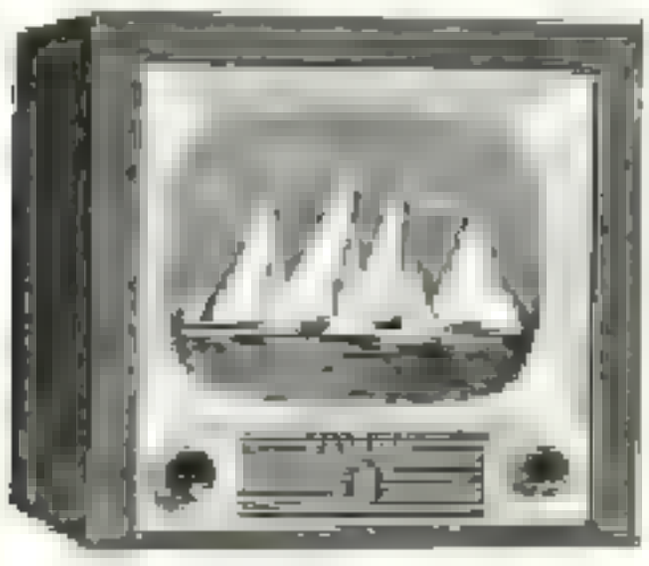

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PHOENIX and the VALLEY of the SUN*

No other area has our warm, clear invigorating air . . . magnificent scenery 18 national monuments. Visit old Mexico. Enjoy 9 fine golf courses. Accommodations for every purse.

*Greatest clear sunshine U. S. Weather Bureau 3695 - 1951 U. S. Weather Bureau

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PHOENIX, ARIZONA

Please send free NEW colorful folders.

NAME

ADDRESS

CITY STATE

I am interested in home [illegible] motel [illegible] apartment [illegible] ranch [illegible]

A Whole New World Awaits You in *Southern California* this Vacation

Not just another vacation, but a completely new experience — a deep-down relief from tensions, a revival of energies, a feeling that comes from relaxing in this glamorous world of color and sunshine. So...

Seek up sunshine as you visit vast valleys, fish with orange groves. See pole [illegible]

Discover the Pacific! Stretch your lines in white sand [illegible] where along 200 miles [illegible]

Explore the desert [illegible]

See Movieland! Mingle with the stars on [illegible]

Don't Wait — Come This Year!

Too often we put off life's most thrilling experiences until, for some reason, it's too late. So plan now to see and enjoy the sun-soaked world of Southern California

FREE! A special color folder [illegible]

[illegible]

PLEASE PRINT NAME AND ADDRESS

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Trade frostbite for suntan!

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TUCSON HAS MORE SUNSHINE than any other resort city. And so much more to see and do. Towering cactus forests . . . cattle ranches and rodeos . . . spectacular desert sunsets . . . major sports events. Enjoy them in Tucson now!

COME RELAX NOW in Tucson's wonderful dry winter sunshine climate. You'll feel like a new person. Golf at fine country clubs . . . swim in year-round pools . . . ride horseback . . . or drive down the new paved highway to Guaymas and explore Old Mexico, our deep-sea fishing

YOUR ENTIRE FAMILY will revive in Tucson's unmatched sunshine. Enroll your youngsters in Tucson's accredited ranch or public schools or University of Arizona. You'll [illegible] the Mexican [illegible] and other [illegible] at the Tucson Festival of Art, April 13 to 27. Arrive with empty luggage. Tucson's [illegible] stores carry exactly what you need. You'll find plentiful accommodations of all kinds (see coupon) at [illegible] rates.

YOUR PLACE IN THE SUN IS

Tucson

IN FRIENDLY ARIZONA

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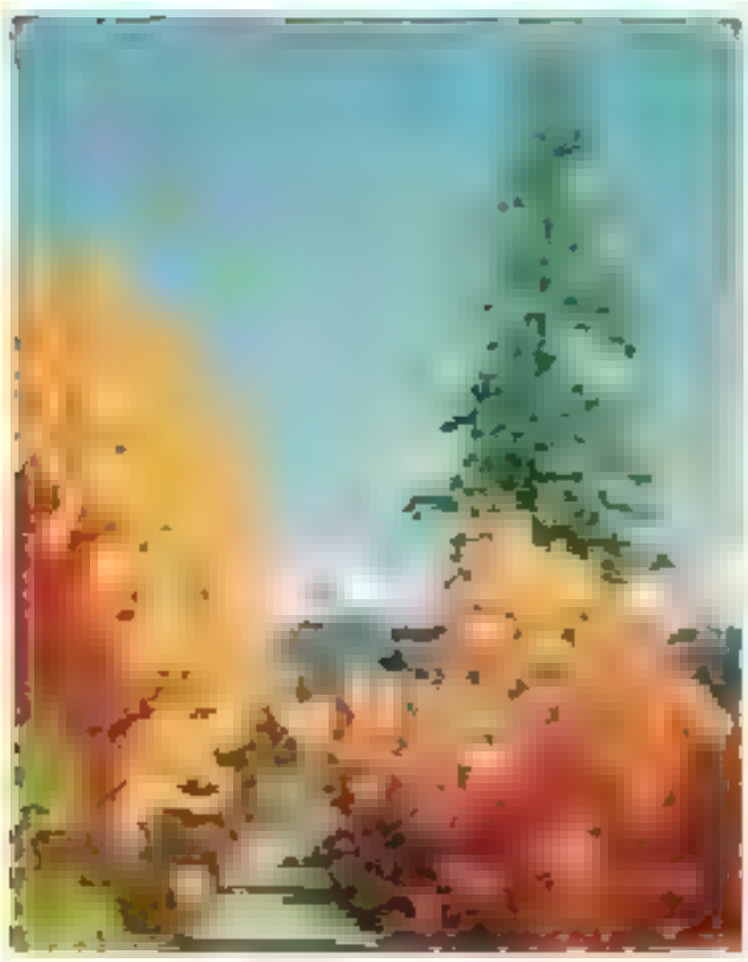
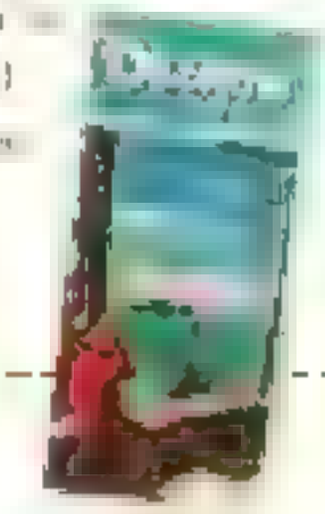


You'll Remember Oregon!

In True Western Spirit, [illegible]

[illegible]

Send coupon for free illustrated booklet



HARD-OF-HEARING?

You'll Bless Us for this New, FREE, 24-Page Book that Tells the

truth about hearing aid claims

[illegible]

AND ONLY ZENITH HEARING AIDS GIVE YOU ALL THESE QUALITY FEATURES

EXCLUSIVE NEW PATENTED PERMAPHONE — matches excellent performance of 100 ohms entirely heat or humidity.

RESERVE BATTERY SWITCH — insures continuous hearing in event of "A" battery failure.

4 WAY FINGER TOUCH TONE CONTROL — adjusts instantly to give emphasis to high, medium, low or full range of tones covered by the instrument.

FINGERTIP VOLUME CONTROL — a Zenith instant variation of volume needed to hear anything from a whisper to a concert.

The Royalty of Hearing

By Makers of World Famous Zenith Radio, Television and FM Sets

This Book May Be Worth $100 or More to You! Published Only to Give You the Facts

Winning the time now Zenith Hearing Aid has rapidly become as famous as accountable as wearing eyeglasses. Yet Zenith knows there are many who hesitate to purchase any hearing aid because of doubts and misgivings caused by conflicting claims. Now—in one complete book—Zenith takes off the gloves—and answers these questions—strips all the mystery from hearing and buying.

"What does the American Medical Association say about hearing aids?" "Are 'invisible' aids really invisible?" "How can I tell what to expect before I'm fitted about hearing aid?" "Why should I go to my doctor for advice about hearing?" "How can I get better for less money?" "What is true, and what leads only to disappointment in hearing aid claims?"

To the point of Average! You will find this the most valuable and revealing set of facts yet published.

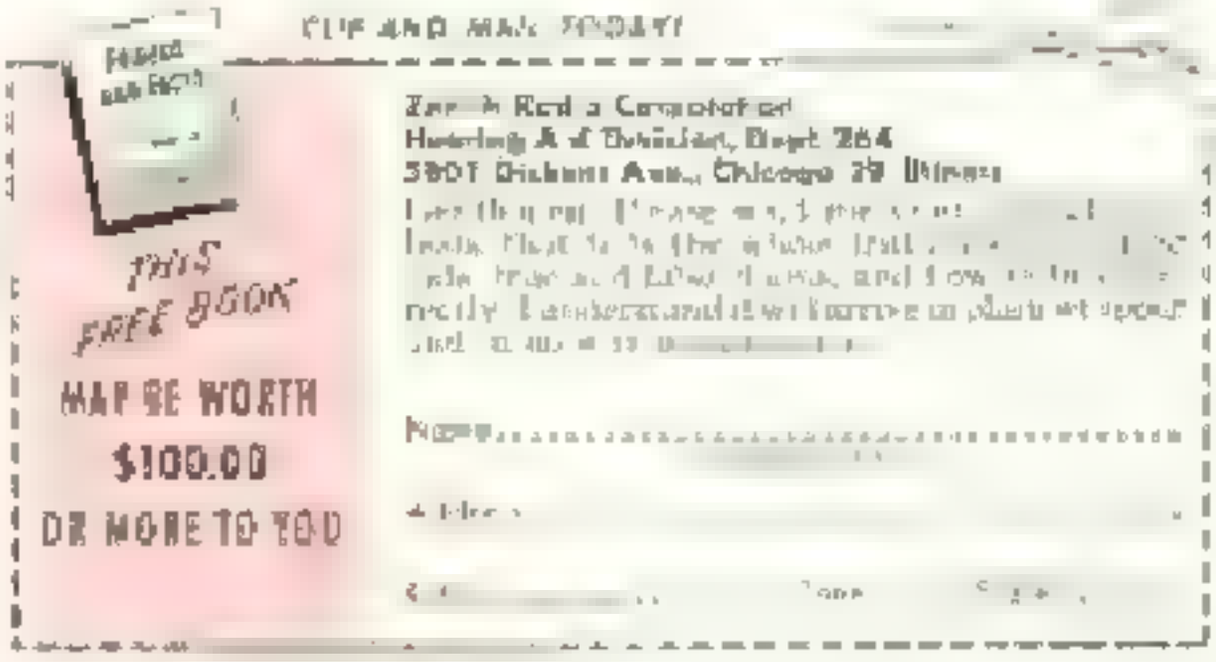
Free! Conduct on [illegible] available at most [illegible] cost.

A WHOLE NEW LIFE AHEAD FOR THE HARD-OF-HEARING

Hear Better or Pay Nothing. We believe no hearing aid must sell for more than $75. Here is Zenith's unconditional guarantee of quality: "If any $100 aid in your opinion, in any way outperforms a $75 Zenith, we'll money back under our unconditional 10-day return privileges. You shall be the sole judge." Clip all your "Classified" telephone directory for dealer.

[illegible]

CLIP AND MAIL TODAY!



The Lily . . . Its Symbolism: In symbols and epitaphs, the story of a life can be eloquently told on a monument. In the language of flowers, the lily expresses purity, innocence and heavenly joy. It is the flower of the Resurrection. On your family monument, the lily will be a constant source of inspiration to you, your children . . . and their children.

"These were the books he loved . . ."

"He loved the feel and weight of leather in his hand, but loved even more the wisdom he found in his books. He stood for all that is fine in life—honesty and dignity . . . generosity and love.

"We try to live as he lived . . . try to make his love of man our own.

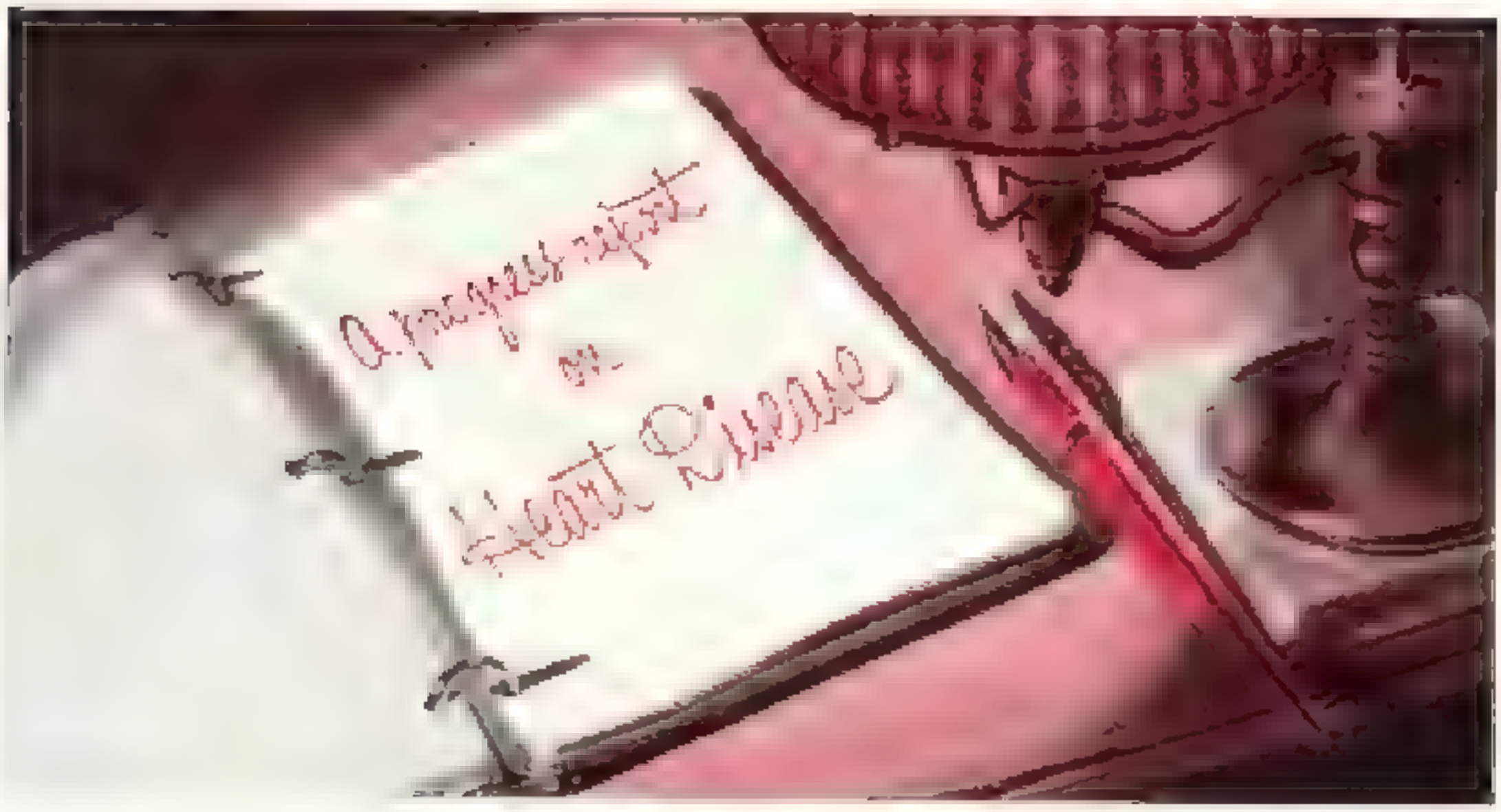
"His resting place, in our family plot, knows the beauty of flowers and clean winds. His memory is cherished for the love and admiration of those he left behind."

Many thoughtful people choose their family monument as well as their cemetery plot [illegible] *need arrive.* Ask your nearest Rock of Ages dealer for [illegible] How To Choose a Family Monument [illegible] illustrated booklet available without obligation. You'll find his name in the Classified Section of the Telephone Directory. Or write Rock of Ages, Barre, Vermont.

ROCK of AGES

BARRE GRANITE FAMILY MONUMENTS

Before you choose, compare—ask your Architectural Dealer to show you proof of permanence of other materials



Rheumatic heart disease—of the heart and blood vessels—has brought impressive advances that are helping to save many lives today.

Recurrent attacks of rheumatic fever—the chief threat to the hearts of children—may be prevented by penicillin or other drugs. New hormone compounds are also proving helpful in treating acute rheumatic fever, even in cases in which the heart has been seriously injured.

Diseased coronary arteries that nourish the heart can be treated more effectively now than ever before with certain drugs that prevent the formation or spread of blood clots. Studies show that under [illegible] about one-third [illegible] properly [illegible] these drugs.

[illegible] made [illegible] that attack the valves of the heart. Heart-[illegible] infections [illegible] of these cases [illegible].

[illegible] disorders. [illegible] the [illegible] suspected [illegible].

Even with these and other advances, a series of the heart and blood vessels continues to be the greatest hazard to life. Some 9 million Americans are affected by it now, and it [illegible] account for about 44 percent of the total mortality in our country.

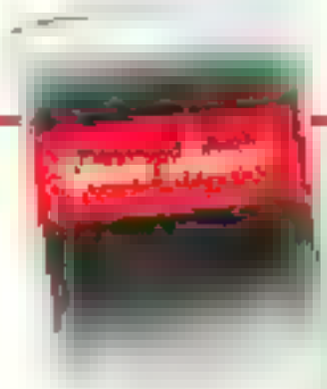
[illegible], however, that much can be done [illegible] the heart, to reduce the risk [illegible]. Here are some measures that are [illegible]:

1. Do not ignore possible warnings of heart trouble. [illegible] pain or a feeling of oppression in the chest, [illegible] of the heart, [illegible] of breath and excessive fatigue. Such [illegible] not [illegible], but their true meaning should be determined [illegible].

2. Have periodic medical check-ups. Everyone [illegible] chronic ailments. Such [illegible] heart trouble [illegible] will be [illegible].

3. [illegible] a new way of [illegible] living. Such a [illegible] should include a nourishing diet, getting plenty of rest and sleep, trying to avoid tensions and [illegible] the latter in [illegible] weight is a contributing factor [illegible].

Metropolitan Life Insurance Company



Name

Street

City _____ State

Community brush-off

EVERY YEAR, when the sun [illegible] at Point Barrow to end the winter [illegible] Eskimos of [illegible] burning [illegible]

After they've [illegible] dishing [illegible] our [illegible]

Then, when the blaze burns [illegible] the embers cool it. As a final gesture [illegible] the clothes to shake our demons [illegible]

And the troubles that may beset them during the coming year—the slips, falls, fires and other accidents that may happen—are supposed to perish in the flame.

It would be a fine thing, [illegible] But it won't work for you any better than it does for the Eskimos.

[illegible] though, so accidents will never [illegible]

[illegible] protection plan.

MORAL: INSURE IN

The Travelers

ALL FORMS OF INSURANCE AND SURETY BONDS

The Travelers Insurance Company · The Travelers Indemnity Company · The Travelers Fire Insurance Company · The Charter Oak Fire Insurance Company, Hartford 15, Connecticut. Serving the insuring public in the United States since 1864 and in Canada since 1915.

Coke follows thirst everywhere

On the move or at the camp PX, a stop at the [illegible] machine is [illegible] warm and friendly. And when your hand's around a frosty bottle of Coke, you've got the upper hand on thirst. Yes sir, I know


Kodak
You see it in color, and with
your camera you can get it in color
It's so simple! The
you just fold in the directions packed with
every roll. And when your pictures come back
wonderful! They're
and you can share your enjoyment of them with
Eastman Kodak Company, Rochester 4, N. Y.
It's Kodak for Color

Recommendation for Membership

IN THE

NATIONAL GEOGRAPHIC SOCIETY

** The Membership Dues, Which Are for the Calendar Year, Include Subscription to the National Geographic Magazine*

To the Secretary, National Geographic Society,
Seventh and M Streets Northwest, Washington 6, D. C.: *1952*

I nominate. _____ _____
(Print name in full)

Occupation _____
(This information is important for the records)

Address _____
(Street number)

for membership in The Society.

Name of nominating member _____

Address _____

Stalking Birds with Color Camera

A 1/5000-second Flash Exposure Reveals a Hummingbird's "Invisible" Wings

189 Full Pages of Color in NATIONAL GEOGRAPHIC'S New Book! Amazing Speed-flash Kodachrome Close-ups of Wild Birds, Undisturbed in Their Natural Habitat

"STALKING BIRDS WITH COLOR CAMERA" brings you an entirely new close-up of wild bird life. This natural history treasure is the first book on birds to be profusely illustrated with NATURAL-COLOR photographs—many in full-page size! Most of them were taken from concealment within arm's reach of the wild subjects—flying, brooding on the nest, and feeding their young.

Beautiful beyond comparison, this book is a result of 30 years of distinguished ornithological achievements by Dr. Arthur A. Allen. His notable researches and field expeditions, sponsored in great part by the National Geographic Society, have added immeasurably to North American bird lore. Publication of this volume adds another important contribution of The Society to its educational purposes—the increase and diffusion of geographic knowledge.

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It may be the familiar "Voice with a Smile" of the telephone operator. Or a friend or business customer. Or a stranger you're meeting — and judging — for the first time by telephone.

Any time is a good time for telephone courtesy. But right now, when the rush is on and minutes are scarce, it is doubly appreciated.

All 'round the clock it saves time and tempers and helps everybody get more things done, more quickly.

BELL TELEPHONE SYSTEM

150 Extra Engineers

An IBM Electronic Calculator speeds through thousands of intricate computations so quickly that on many complex problems it's just like having 150 EXTRA Engineers.

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